





TEXAS TECH UNIVERSITY HEALTH SCIENCES CENTER.



Welcome from the Office of Research and Innovation Small Molecules, Big Impact Targeted Disease Breakthroughs Advancements in Neuroscience A Neuroscience Pioneer **Facilitating Neuroscience Research** Maternal and Pediatric Health Discoveries Shared Efforts, Stellar Outcomes Research at a Glance Noteworthy Research Articles Closing Gaps in Health Care **Evolution of TTUHSC Facilities** Accelerating Health Outcomes **Cancer Research Initiatives Research Awards Spotlight** Achievements and Accolades Inspiring Innovators Innovate, Commercialize, Succeed Office of Research Divisions of Support TTUHSC: Research **Oversight Committees**

Leadership

WELCOME FROM THE OFFICE OF RESEARCH AND INNOVATION



Texas Tech University Health Sciences Center (TTUHSC) is the leading academic health center serving the research, education and health care needs of a vast region that extends from West Texas and Eastern New Mexico to the Dallas-Ft. Worth area. Our Texas service area includes 114 counties and 131,000 square miles – larger than the six states of New England combined – which is 50% of the landmass of the State of Texas. However, only 10% of the state's population resides within this very large region. These rural communities are a precious state resource, as they generate key commodities essential to the well-being of our nation and the world, including beef, cotton, petroleum and natural gas. The 50-plus years of our university's existence has witnessed the creation of six schools – medicine, nursing, health professions, pharmacy, graduate school of biomedical sciences and population and public health – and expansion into multiple campus locations including Lubbock, Amarillo, Abilene, Odessa, Midland, Dallas and beyond. We maintain a strong bond with TTUHSC EI Paso, the Texas Tech University System's second university health sciences center. Together, we are proud to serve our communities through the delivery of world class clinical care, interprofessional health care training and preeminent research and scholarship. TTUHSC has achieved designation as both a Hispanic-Serving Institution and the distinction of a Carnegie classified special focus four-year research institution.

The research pillars of TTUHSC include cancer, neuroscience, cardiometabolic disorders and infectious disease. In the past year, our faculty have advanced knowledge ranging from understanding the mechanisms of ion channel function to improving the delivery of crucial therapeutics. Our researchers are engaged in diverse studies of maternal preeclampsia and childhood autism to investigating the effects of e-smoking, aging, gender differences on brain health and chronic pain conditions. Through a spectrum of scientific exploration spanning from basic to translational, and addressing issues from fetal health to the well-being of our aging population, no key demographic is overlooked by our faculty researchers.

The research accomplishments of our university positively impact the communities we serve; however, many serious challenges remain. The counties of our service region experience some of the worst health disparities in the nation: 84 are designated medically underserved, 35 lack a single health care provider and many areas are completely lacking in maternity care. Obesity rates average 45%, and the adverse health effects of cancer, lung disease, stroke, mental illness and drug addiction are greater in our rural areas as compared with urban centers in our state.

As we reflect upon the accomplishments of 2023, I am proud to stand together with the faculty, staff and students responsible for the research and innovation advancements of TTUHSC. I hope the accomplishments described and celebrated in this annual report further inspire our university community to transform health care through innovation and collaboration, forging a path toward a healthier and promising future for our diverse population who entrust us with the future of health.

Sincerely,

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Lance R. McMahon, Ph.D.

SMALL MOLECULES, **BIG IMPACT**

TTUHSC's La-Beck to Study Cancer Drug Delivery Via Nanoparticles

To reduce the side effects associated with chemotherapy treatments, researchers have investigated the use of delivery systems that can take more drugs directly to the tumor. Transporting drugs to a tumor via nanoparticles, which are about the size of a virus particle, is one of the most promising delivery methods for overcoming chemotherapy issues. Ninh (Irene) La-Beck, Pharm.D., from the Department of Immunotherapeutics and Biotechnology at TTUHSC's Jerry H. Hodge School of Pharmacy, is investigating one such nanoparticle delivery system that uses liposomes to transport the drugs to the target tumor. Liposomes are artificial orb-like sacs typically created from cholesterol and natural non-toxic phospholipids, or lipids whose molecules include a group of phosphates. To help her investigation into how nanoparticles interact with the immune system and cancer, La-Beck in September 2023 received a five-year, \$2.49 million grant ("Cholesterol metabolism in the pharmacology of liposomal therapeutics") from the National Cancer Institute at the National Institutes of Health.

A Big Step in Structural Biology: **Cuello to Apply Novel Methods in Potassium Channel Study**

The composition of every living cell includes small, highly specialized conduits known as potassium (K+) channels that are responsible for the extremely selective and rapid transport of K+ ions across cell membranes. The unique transport mechanism utilized by K+ ions defines the correct functional behavior of every living cell. In doing so, the K+ transport mechanism effectively controls a variety of very complex processes such as the normal electrical activity of brain neurons and the rhythmical beating of the human heart. Luis Cuello, Ph.D., a professor in the Department of Cell Physiology and Molecular Biophysics at the TTUHSC School of Medicine, has made a career of studying potassium channels. To continue his work, Cuello was awarded in April 2023 a five-year, \$2.12 million R35 MIRA grant ("A comprehensive thermodynamic and structural characterization of ion channel function and its regulation by the lipid bilayer composition") from the National Institutes of Health.





LUIS CUELLO, PH.D.

TARGETED DISEASE BREAKTHROUGHS



With a survival rate in the single digits, pancreatic ductal adenocarcinoma (PDAC) is highly lethal. In fact, by the time PDAC is clinically diagnosed, it is already considered incurable via surgery or other means in up to 90% of patients. Yangzom D. Bhutia, DVM., Ph.D., from the Department of Cell Biology and Biochemistry at the TTUHSC School of Medicine, has for vears focused her research on PDAC. To bolster her efforts, the National Cancer Institute at the National Institutes of Health in 2023 awarded Bhutia a five-year, \$1.76 million grant ("SLC6A14 as a unique drug target to treat pancreatic cancer") to investigate potential novel treatments for this often-silent killer. With this grant, she will focus on the amino acid transporter known as SLC6A14 (ATB0,+) and its relevance to PDAC. SLC6A14, an amino acid transporter, is significantly upregulated in PDAC. Bhutia endeavors to study its use as a drug target to potentially treat pancreatic cancer.

ADVANCEMENTS IN NEUROSCIENCE

Abbruscato Lab Investigates E-Cig Impact on Brain Health

Most people agree that electronic cigarette (E-Cig) use is safer than traditional tobacco smoking, but are e-cigarettes safe? A TTUHSC research group led by Thomas Abbruscato, Ph.D., chair for the Department of Pharmaceutical Sciences at the Jerry H. Hodge School of Pharmacy, has asked this question since the first e-cigarette products appeared in the U.S. Their efforts have primarily focused on use and impact on brain health and the risk of neurovascular diseases such as stroke. Over the last decade, focused e-cigarette engineering has created more efficient nicotine delivery systems that are tolerated better by users than conventional cigarettes, resulting in e-cigarette users exposing the brain to much higher levels of nicotine. After previously studying the effects of tobacco smoke and e-cigarette vapor exposure on neuroinflammation, the blood-brain barrier (BBB) and oxidative injury, which increases the risk and worsens the outcome for stroke, Abbruscato currently is working with collaborators from the Oakland University William Beaumont School of Medicine to study the growing population of mixed users (vapor and tobacco smokers), including BBB damage and the risk and severity of stroke.



THOMAS ABBRUSCATO, PH.D.

TTUHSC Study Explores Intricacies of Healthy Brain Aging The aging process is an intricate and multifaceted phenomenon, with the human brain undergoing a series of changes over time. Yet, despite the undeniable importance of understanding the biological mechanisms underpinning brain aging, there remains a conspicuous scientific knowledge gap. In a 2023 study published in Ageing Research Reviews ("Healthy brain aging and delayed dementia in Texas rural elderly"), a team of researchers from the TTUHSC School of Medicine sought to address this gap by delving into the intricate interplay of biological, psychosocial and environmental factors that may influence healthy cognitive aging. The team, led by P. Hemachandra Reddy, Ph.D., from TTUHSC's Department of Internal Medicine, utilized a comprehensive approach that combined anthropometric measurements (quantitative body measurements to estimate a person's nutritional status), blood biomarker testing, surveys and structural brain magnetic resonance imaging scans. The paper reveals the baseline characteristics of the two groups and highlights significant correlations and distinctions that provide critical insights into the complexities of healthy



brain aging.

P HEMACHANDRA REDDY PH I



YANGZOM D. BHUTIA, D.V.M., PH.D.

FACILITATING NEUROSCIENCE RESEARCH

NEUROSCIENCE PIONEER



VOLKER NEUGEBAUER. M.D., PH.D.

OFFICE OF RESEARCH & INNOVATION 2023 ANNUAL REPORT

NEUGEBAUER FORGOES PHILOSOPHY. THEOLOGY TO BECOME EXPERT IN **PAIN RESEARCH**

With five current R01 grants from the National Institutes of Health — an accomplishment matched by fewer than 1% of principal investigators — and more than \$14 million in NIH funding awarded to him since he joined TTUHSC in 2014, one might assume Volker Neugebauer, M.D., Ph.D., was destined to be a scientist. However, he actually studied philosophy and theology as an undergraduate in Germany, where the empirical sciences were believed at that time to capture a very narrow aspect of the world versus philosophy and theology that dealt with the world's big questions. Now, 30 years after becoming a clinically trained neuroscientist, Neugebauer has received millions of dollars in grants and published more than 160 scientific papers in some of the world's most impactful journals. Although he has researched other conditions such as addiction, epilepsy, schizophrenia, Parkinson's disease and Alzheimer's disease, the majority of Neugebauer's work has dealt with the relationship between pain and the amygdala, and he has become a renowned expert in pain research. In addition, he serves as executive director and chief scientific officer at TTUHSC's Garrison Institute on Aging where his responsibilities include oversight of Project FRONTIER, a longitudinal study of aging and cognitive decline in a multi-ethnic sample of adults living in rural communities.

THE GARRISON INSTITUTE ON AGING has been actively engaged in diverse research programs aimed at advancing our understanding of Alzheimer's disease-related neurodegenerative disorders, and brain functions in general. Its research spans both preclinical investigations and studies involving human subjects. In the realm of preclinical research, the Garrison Institute on Aging focuses on uncovering the underlying causes of Alzheimer's disease and other forms of dementia, with a particular emphasis on identifying potential therapeutic targets. It has ongoing investigations into mitochondrial dysfunction in Alzheimer's disease and the dysfunction of a transsynaptic signaling complex, utilizing animal and human brain tissues. These studies aim to address a critical knowledge gap by identifying neurobiological mechanisms that may precede and precipitate the pathology associated with Alzheimer's disease. Additionally, the Garrison Institute on Aging is actively involved in Project FRONTIER, an initiative designed to collect epidemiological data on cognitive health and aging in a multi-ethnic adult population residing in rural communities in West Texas. This project not only explores cognitive health, but also assesses participants' perceptions and experiences related to COVID-19, highlighting disparities in access to testing, vaccines and the impact of the virus on urban and rural communities. Project FRONTIER's data serve as the foundation for numerous collaborative research endeavors, student research projects, and grant applications. Overall, the Garrison Institute on Aging plays a pivotal role in advancing our understanding and management of Alzheimer's disease and other forms of dementia, and enhancing the well-being of aging populations, particularly in rural areas.

THE CENTER OF EXCELLENCE FOR TRANSLATIONAL NEUROSCIENCE AND THERAPEUTICS

The Center of Excellence for Translational Neuroscience and Therapeutics is a pioneering center dedicated to expanding the understanding of nervous system mechanisms, various brain diseases and clinically relevant neurological and psychiatric disorders. Its primary goal is to drive the creation of innovative diagnostic and therapeutic approaches. Center of Excellence for Translational Neuroscience and Therapeutics fulfills this mission by actively fostering collaboration, coordination and leadership in research initiatives, acting as a conduit between basic scientific inquiry and clinical applications. By uniting basic researchers with colleagues involved in human subject studies, the center serves as a vital platform for merging diverse disciplines. Moreover, Center of Excellence for Translational Neuroscience and Therapeutics offers specialized expertise and guidance across translational research spectrums, spanning from molecular investigations to comprehensive analyses of systems and culminating in the facilitation and support of clinical studies. Ultimately, the center's multifaceted approach aims to catalyze the development of transformative tools and strategies for improving health care outcomes in neurological and psychiatric domains.



Neuroscience – Neurology – Psychiatry

MATERNAL AND **PEDIATRIC HEALTH** DISCOVERIES



CHRISTINE GARNER, PH.D., R.D.

TTUHSC Researchers Receive NIH Grant to Address Preeclampsia Rates

According to a study recently published by the Journal of the American Medical Association, maternal morbidity and mortality rates in Texas have more than doubled from 1999 (10.3 deaths per 100,000 births) to 2019 (21.9 deaths per 100,000 births). This rate not only exceeds the national average (17.4 in 2018), but it also places Texas at or near the bottom of most metrics used to estimate maternal, fetal and neonatal health and safety. Preeclampsia is a major cause of maternal mortality, and it increases risk for delivery complications, preterm birth and future cardiovascular disease. In the Texas Panhandle, high rates of chronic disease, poor socioeconomic circumstances and poor maternity care access increase maternal risks. The National Heart, Lung and Blood Institute at the National Institutes of Health awarded a two-year, \$1.47 million grant in 2023 to a research coalition led by TTUH-SC's Christine Garner, Ph.D., R.D., Julie St. John, Dr.P.H., and Stephanie Stroever, Ph.D., MPH. This Phase I study will use implementation science and community engagement to examine the landscape of implementing preeclampsia screening and prevention interventions in six Texas Panhandle counties, and will inform development of a Phase II implementation trial.

Meta-Analysis Shows Association Between Autism in Children and **Cardiometabolic Diseases**

A study conducted by the Centers for Disease Control and Prevention from 2009 to 2017 determined that approximately 1 in 44 children ages 3-17 are diagnosed with some form of autism spectrum disorder (ASD). Research also has established that children with ASD have an increased risk of obesity. which has been linked to increased risks for cardiometabolic disorders such as diabetes and dyslipidemia (elevated levels of cholesterol or fat in the blood). However, the question of whether there is an association between autism, cardiometabolic disorders and obesity remains largely unanswered. To help provide insight into the possible ASD-cardiometabolic diseases link, Chathurika S. Dhanasekara, M.D., Ph.D., Chanaka N. Kahathuduwa, M.D., Ph.D., and a collaborative team from TTUHSC and Texas Tech University conducted a systematic review and meta-analysis using the PubMed, Scopus, Web of Science, ProQuest, Embase and Ovid databases. Their study, "Association between autism spectrum disorders and cardiometabolic diseases: a systematic review and meta-analysis," was published in January by JAMA Pediatrics, a journal of the American Medical Association.



CHANAKA N. KAHATHUDUWA. M.D., PH.D.

SHARED EFFORTS, STELLAR OUTCOMES

ANDREY KARAMYSHEV, PH.D

TTUHSC-TTU Research Collaboration Leads to Possible Drug Targets for Leishmaniasis

Leishmaniasis is found in approximately 88 countries, with as many as 1 million new cases diagnosed each year and more than 350 million people at risk of infection. Some forms of the disease have emerged in Mexico and Texas in recent years. Because there are very few options for treating the disease, there exists an urgent need to understand the resistance mechanisms associated with antimonial drugs so that more effective treatment options can be developed. To help address the dearth of leishmaniasis treatments, Andrey Karamyshev, Ph.D., from TTUHSC, Zemfira Karamysheva, Ph.D., from Texas Tech University (and currently an associate professor at TTUHSC) and collaborators from the University of Antioquia in Medellín, Antioquia, Colombia in 2023 completed a study to determine the molecular mechanisms responsible for producing antimony drug resistance in Leishmania parasites. Their study ("Translational reprogramming as a driver of antimony-drug resistance in Leishmania") was published in May by Nature Communications and was featured by the journal editors' Highlights of Recent Research.

Above photo: Chromatin structures of cell nuclei in a mouse renal carcinoma sample stained with a DNA fluorescent dye (SiR-DNA). The images were acquired using a 100x oil immersion objective on the Leica Stellaris 8 FALCON STED confocal super resolution microscope, in the CPRIT-funded Imaging Core Facility (Jerry H. Hodge School of Pharmacy, Amarillo campus) STED (Stimulated Emission Depletion) provides optical super resolution of structures down to the 30-50 nm scale, which is below the diffraction limit of conventional optical microscopes (~250-300 nm). Fluorescence life-time gating further enhances contrast of STED images. The rounded nuclei represent nuclei of tumor cells, the longitudinal structures represent nuclei of endothelial cells (cells lining the blood capillaries). Panel A = STED image. Panel B = tau-STED (fluorescence life-time gated STED). Scale bar = 2µm. This sample is provided by Magda Karbowniczek, Ph.D. (Jerry H. Hodge School of Pharmacy, Abilene).



ZEMFIRA KARAMYSHEVA, PH.D



ULRICH BICKEL, M.D.

Rare Microscope Brings New Opportunities to TTUHSC; USDA Subcontract Could be First of Many Collaborations with TTU Vet School

Using part of a \$2.8 million Core Facility Support grant he was awarded in 2020 by the Cancer Prevention and Research Institute of Texas (CPRIT), Ulrich Bickel, M.D., professor and associate dean of sciences at the TTUHSC Jerry H. Hodge School of Pharmacy purchased a Leica Stellaris 8 Falcon STED Super resolution confocal microscope, a unique and rare microscope system that allows investigators to produce optical images of living cells at a resolution previously achievable only by electron microscopy. In 2023, some of the approximately 1,300 hours during which the microscope was in operation were logged by Bickel himself when he was named a subcontractor on a grant awarded by the United States Department of Agriculture to Fernanda Trindade da Rosa, Ph.D., from the Texas Tech University School of Veterinary Medicine. Rosa is investigating how microR-NAs (miRNAs) found in the very first milk that a cow feeds her calf affects the ability of calves to fight infection during their first few weeks of life. One of the project objectives is to use the super resolution confocal microscope to look at these miRNAs and label them with florescent dyes.

RESEARCH AT A GLANCE



TTUHSC External Funding Awards Received Research Projects vs Other Sponsored Projects



Note: Increased FY 2022 data is due to the receipt of a multimillion-dollar state and federal ARPA award.

NOTEWORTHY RESEARCH ARTICLES

A successful research program often results in publications whereby notable findings are shared with the greater scientific community. The articles referenced below are a sampling of articles published in high impact journals (13.8 and above) during 2023. Researchers from TTUHSC have been marked in bold in the citations that follow. Impact Factors are used to measure the importance of a journal by calculating the number of times selected articles are cited within the last few years.

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Birk MA, Liscovitch-Brauer N, **Dominguez MJ**, McNeme S, Yue Y, Hoff JD, Twersky I, Verhey KJ, **Sutton RB**, Eisenberg E, Rosenthal JJC. Temperature-dependent RNA editing in octopus extensively recodes the neural proteome. <u>Cell</u>. 2023 Jun 8;186(12):2544-2555.e13

Panda A, Giska F, Duncan AL, Welch AJ, Brown C, McAllister R, **Hariharan P**, Goder JND, Coleman J, Ramakrishnan S, Pincet F, **Guan L**, Krishnakumar S, Rothman JE, Gupta K. Direct determination of oligomeric organization of integral membrane proteins and lipids from intact customizable bilayer. <u>Nat Methods</u>. 2023 Jun;20(6):891-897.

Dhanasekara CS, Ancona D, Cortes L, Hu A, Rimu AH, Robohm-Leavitt C, Payne D, Wakefield SM, Mastergeorge AM, Kahathuduwa CN. Association Between Autism Spectrum Disorders and Cardiometabolic Diseases: A Systematic Review and Meta-analysis. JAMA Pediatr. 2023 Mar 1;177(3):248-257.

Prateeksha P, Sharma V, Nagpoore N, Jadaun V, Rao C, Singh B. Bacteria-Responsive Multidrug Delivery Nanosystem for Combating Long-Term Biofilm-Associated Infections. <u>Advanced Functional Materials</u>, 2023 April; 33. 10.1002/ adfm.202214852.

Lamberton TJJ, **Dissanaike S**, de Virgilio C. Addressing Burnout in Surgery-Where Did the Yabba Dabba Doo Go? <u>JAMA</u> <u>Surg</u>. 2023 Feb 1;158(2):112-114.

Gutierrez Guarnizo SA, Tikonova EB, Karamyshev AL, Muskus CE, **Karamysheva ZN**. Translational reprogramming as a driver of antimony-drug resistance in Leishmania. <u>Nat Commun</u>. 2023 May 5;14(1):2605.

Do HQ, Jansen M, Binding motif for RIC-3 chaperon protein in serotonin type 3A receptors. <u>J Gen Physiol</u>. 2023 Jun 5;155(6):e202213305.

Ito H, Navratilova E, Vagnerova B, Watanabe M, Kopruszinski C, Moreira de Souza LH, Yue X, Ikegami D, Moutal A, Patwardhan A, Khanna R, Yamazaki M, Guerrero M, Rosen H, Roberts E, **Neugebauer V**, Dodick DW, Porreca F. Chronic pain recruits hypothalamic dynorphin/kappa opioid receptor signaling to promote wakefulness and vigilance. <u>Brain</u>. 2023 Mar 1;146(3):1186-1199.

Srivastava SK, Kim SH. Special issue: Modulation of immune checkpoint proteins and their networks in cancer progression. <u>Semin Cancer Biol</u>. 2023 Aug;93:1-2.

Oladejo M, Paulishak W, Wood L. Synergistic potential of immune checkpoint inhibitors and therapeutic cancer vaccines. <u>Semin Cancer Biol</u>. 2023 Jan;88:81-95.

Olfson M, Wall MM, Wang S, **Laje G**, Blanco C. Treatment of US Children With Attention-Deficit/Hyperactivity Disorder in the Adolescent Brain Cognitive Development Study. <u>JAMA Netw Open</u>. 2023 Apr 3;6(4):e2310999.

NUMBER OF PUBLICATIONS FROM TTUHSC RESEARCHERS

Publications with multiple TTUHSC authors are only counted once.

| Year | Number of Publications |
|------|------------------------|
| 2021 | 1096 |
| 2022 | 1116 |
| 2023 | 1102 |

Source: Data provided by TTUHSC Library of the Health Sciences, Permian Basin

CLOSING GAPS IN HEALTH CARE



Texas Tech University System Health Policy and Public Health Think Tank Hosted First West Texas Health Disparities Research Symposium

When the inaugural West Texas Health Disparities Research Symposium commenced April 27-28 at the TTUHSC Academic Event Center, it marked the largest event resulting from the work of the Texas Tech University (TTU) System Health Policy and Public Health Think Tank. The symposium brought together like-minded individuals who are committed to working toward health equity in the West Texas region. The event featured distinguished national keynote speakers, panelists and interactive discussions with health care professionals from various institutions and disciplines across West Texas. Attendees heard speakers seeking to identify health care disparities in West Texas, presentations of primary and secondary data related to those disparities and proposals for current or prospective interventions or strategies that can address those issues. The idea for the TTU System Health Policy and Public Health Think Tank arose out of the COVID-19 pandemic when current third-year medical students and think tank co-founders Reagan Collins and Jad Zeitouni became involved with the West Texas 3D COVID-19 Relief Consortium and witnessed firsthand the value of collaboration.

SUPPORT HEALTH CARE DELIVERY IN WEST TEXAS



The TTUHSC community serves 114 counties encompassing 131,000 square miles across the greater West Texas region, accompanied by bordering counties in eastern New Mexico, southeastern Colorado and western Oklahoma whose populations seek treatment in our West Texas health care facilities. Our counties experience some of the worst health disparities in the nation: 84 counties are designated medically underserved, 35 counties lack a single health care provider and 100 counties lack a psychiatrist or an OB/GYN physician. In December, testing began on a new way to improve health care accessibility to Texas residents living in remote and rural areas by using drones, also known as Uncrewed Aerial Systems (UAS). TTUHSC, a part of the Matador UAS Consortium, is spearheading the research initiative focused on developing and integrating drone technology for health care delivery in rural areas. The Matador UAS Consortium was co-developed by TTUHSC and 2THEDGE, LLC. The eight-foot by nine-foot drone used for the December demonstration took its first test flights, traveling round-trip several times between Presidio and Alpine, Texas, a total of 74 miles each way. This was the first and longest medical mission in the U.S. by Australian-based company Swoop Aero, which provided the drone technology, technical support and pilot training. Future tests will measure the impact on the materials the drone carries, such as vaccines, medications, medical supplies and blood and tissue samples, and the drone itself, including maintenance, programming and flying.

EVOLUTION OF TTUHSC FACILITIES



2016

Dedicated HazMat Storage created in Amarillo.

2019

Institute of Anatomical Sciences lab constructed in Lubbock.



2019 Academic Classroom Building constructed in Odessa.







TTUHSC CAMPUSES + SERVICE REGION



TTUHSC's ARPA-H Membership Will Spur Innovation, Improve Health Care Access for West Texans

Imagine if scientists developed a customizable cancer vaccine that was available and affordable for everyone. What if a patient scheduled for surgery also had the option of taking a pill whose composition includes nanorobotics capable of performing the procedure? The Advanced Research Projects Agency for Health (ARPA-H) is seeking to take such ideas from the drawing board to the patient, and TTUHSC will be part of the effort. Established as part of the National Institutes of Health in March 2022 and armed with a \$1 billion budget for three years, ARPA-H is a federal funding agency that supports high-impact research capable of driving biomedical and health breakthroughs that can deliver transformative, sustainable and equitable health solutions for everyone. ARPA-H empowers visionary program managers to tackle a specific problem by working with a range of partners using various approaches to solve that problem. All of this collaboration is made possible through one of three regional ARPA-H Customer Experience Hubs that comprise the nationwide ARPANET-H Health Innovation Network. TTUHSC is a member of the Customer Experience Hub located at Pegasus Park in Dallas, which unites and centralizes the capabilities from hub partners, known as spokes, located in Austin, Houston, North Texas and San Antonio. With the addition of TTUHSC, there are 14 academic partner spokes among the 133 spokes representing the cancer research industry and participating in the Dallas consortium. Spokes, considered to be either performers (technology developers) or stakeholders (those impacted by new technologies), are specialized entities whose capabilities, innovation, research and development and population access help to drive health outcomes. All spokes, which include for-profit and non-profit organizations, small scale businesses, government entities and academic institutions, are eligible to compete for any work that is conducted through the consortium.

TTUHSC Cancer Center

The TTUHSC School of Medicine Cancer Center is the center of excellence for cancer research across the university and the South Plains region. Cancer center researchers study the disease in all of its forms, developing new drugs for difficult-to-treat cancers and collaborating with academic investigators and pharmaceutical companies to develop novel models for studying cancers, which are then used to develop clinical trials, some of which are conducted by the South Plains Oncology Consortium (SPOC) that is hosted by the cancer center.

In 2023, cancer center investigators were working with active external grant funding exceeding \$36 million, primarily from the National Cancer Institute (NCI), the Cancer Prevention and Research Institute of Texas (CPRIT), the U.S. Department of Defense and various foundations. cancer center faculty received \$3 million in new grant funding during 2023, the majority of which was awarded from NCI and CPRIT. The total research expenditures by cancer center members from external grants for 2023 was more than \$8.1 million, bringing the total to more than \$78.5 million of external grant funding awarded to the cancer center since its inception in 2008.

The TTUHSC School of Medicine Cancer Center hosts several state and national resource laboratories that support clinical and translational research for childhood cancer. These include the Childhood Cancer Repository for the Children's Oncology Group (COG), a reference laboratory assessing telomere maintenance mechanisms as a biomarker for patients on COG Phase III clinical trials, and the CPRIT-funded West Texas Pharma-cology Core. The COG and the TTUHSC School of Medicine Cancer Center work together to establish, bank and distribute patient-derived cell lines (PDCLs) and patient-derived xenografts (PDXs; tumor or other cancer tissue transplanted from a human patient into a mouse for study) from children with cancer. These models are provided to more than 600 laboratories across 30 countries through the Childhood Cancer Repository, the world-wide repository for childhood cancer cell lines and xenografts that is housed on the TTUHSC campus in Lubbock and funded by Alex's Lemonade Stand Foundation. The 1,404 childhood cancer specimens received for the repository from 2014-2023 enabled the Cancer Center and COG to generate 640 continuous PDCLs and 123 PDXs from childhood cancers.

Another major accomplishment for the TTUHSC School of Medicine Cancer Center has been unifying cancer biobanking in West Texas. From 2014-2023, the SPOC biobanking efforts have resulted in 5,099 specimens from cancer patients, enabling the cancer center to establish 159 PDXs and 161 patient-derived PDCLs from adult cancer patients.



CANCER RESEARCH INITIATIVES

TTUHSC Launches Accredited Pediatric Hematology/Oncology Fellowship to Combat Rising Childhood Cancer Rates

According to the American Cancer Society, nearly 10,000 U.S. children under the age of 15 will be diagnosed with cancer in 2023. More than 1,000 of these diagnosed children will die from the disease, making cancer the second leading cause of death in children ages 1 to 14 after accidents. In addition, the National Resident Matching Program in 2021 received more than 900 applications for 638 positions offered at more than 160 U.S. hematology/oncology fellowships. To help address the fellowship shortage and increase the number of pediatric cancer practitioners, the Accreditation Council of Graduate Medical Education (ACGME) in 2023 approved and accredited a Pediatric Hematology/ Oncology Fellowship in the TTUHSC Department of Pediatrics. The fellowship will be a three-year training program that equips residency-trained pediatricians with the skills and knowledge needed to care for children affected by cancer and blood disorders. The fellowship objectives are to provide high quality training, retain trainees in the region, enhance the existing structure and attract new faculty talent to TTUHSC. Trainees will have the opportunity to gain clinical and research skills at both Lubbock children's hospitals in addition to learning and applying research methods at the TTUHSC School of Medicine Cancer Center. This is the second fellowship training program to be accredited within the TTUHSC Department of Pediatrics, joining the Pediatric Hospital Medicine Fellowship that was established in 2017.

German Completes TMCi Program, Identifies Compounds More Selective to Cancer Cells

In 2023, Nadia German, Ph.D., director of the Medicinal Chemistry program at the TTUHSC Jerry H. Hodge School of Pharmacy, was among 21 researchers and companies selected to join the Accelerator for Cancer Therapeutics, a Texas Medical Center Innovation (TMCi) program that supports investigators and early-stage biotechnology companies conducting innovative and novel work in cancer therapeutics. The nine-month Accelerator for Cancer Therapeutics program, which started in 2021, is funded by the Cancer Prevention and Research Institute of Texas and partners with the Gulf Coast Consortia and the University of Texas Medical Branch. German's TMCi project focused on developing a small molecule treatment for triple-negative and metastatic triple-negative breast cancer and advancing cancer therapeutic projects to the preclinical and clinical phases. German has identified a class of polypharmacology compounds with selectivity to cancer cells over non-cancerous breast epithelial cells. These compounds significantly reduce toxicity toward non-cancerous cells when used in combination with known chemotherapeutics such as doxorubicin, cisplatin and others. This advantage can potentially translate to a much safer treatment and increased survival rate for patients with metastatic triple-negative breast cancer, one of the most aggressive breast cancer types. TTUHSC also will be represented in the TMCi Accelerator for Cancer Therapeutics program in 2024, as Hongjun (Henry) Liang, Ph.D., a professor in the Department of Cell Physiology and Molecular Biophysics at the TTUHSC School of Medicine, was among 23 researchers and companies selected for that cohort.

21

RESEARCH **AWARDS SPOTLIGHT**



SHREYAS GAIKWAD. PH.D. CANDIDATE

Society of Toxicology Selects School of Pharmacy Graduate Student for 2023 Award

Shreyas Gaikwad, a Ph.D. candidate in the Graduate Program in Pharmaceutical Sciences at the TTUHSC Jerry H. Hodge School of Pharmacy, was selected by the Society of Toxicology as the 2023 recipient of the Syngenta Fellowship Award in Human Health Applications of New Technologies. He was honored during the organization's 62nd Annual Meeting and ToxExpo March 19-23 in Nashville, Tennessee. Gaikwad, who works in the laboratory of Sanjay K. Srivastava, Ph.D., has been a Society of Toxicology member since 2019. As a student researcher, the Society of Toxicology has provided him with a wide platform for networking with experts in the field of toxicology, especially in areas such as carcinogenesis, drug discovery, safety assessment and others. Gaikwad's primary project focuses on discovering the anti-cancer potential of compounds that have been approved previously for indications other than cancer. This concept is known as drug repurposing, and by using this strategy, Gaikwad identified the anti-cancer potential of a specific compound against pancreatic ductal adenocarcinoma.



Billy U. Philips, Ph.D., M.P.H. and TTUHSC President Lori Rice-Spearman, Ph.D.



From left: TTUHSC President Lori Rice-Spearman, Ph.D., Thomas J. Abbruscato. Ph.D., and TTUHSC Provost and Chief Academic Officer Darrin D'Agostino, D.O., MPH.

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TTUHSC President Lori Rice-Spearman, Ph.D., and Gail Cornwall, Ph.D.

TTUHSC's Guindon Earns International Award for Cannabinoid Research

There are more than 480 naturally occurring compounds present in the cannabis plant, more than 100 of which are considered to be cannabinoids. One of those cannabinoids, known as cannabidiol or CBD, also is present in the hemp plant and is today found in a myriad of over-the-counter products touted to provide relief from conditions such as weight management, anxiety, depression, sleep disorders and pain. Despite the proliferation of cannabidiol, and the legalization of cannabis for recreational use in states across the country, cannabinoids in general are a relatively new field of study, and one around which Josee Guindon, DVM, Ph.D., an associate professor and graduate advisor, has built her research career. She has published 52 manuscripts (h-index 27) and seven book chapters, and delivered more than 50 invited talks. For those efforts, she was named the 2023 William A. Devane Young Investigator Award honoree by the International Cannabinoid Research Society. The award shines a light on researchers who have demonstrated dedication, perseverance and skill in studying and researching the endocannabinoid system. The unique and prestigious international award showcases investigators demonstrating outstanding contributions to the cannabinoid field within 15 years of receiving their Ph.D.



Abbruscato and Philips Appointed Grover E. Murray Professors

The Grover E. Murray Professorship is awarded to faculty members who have attained national and international distinction in their fields for outstanding research, excellence in scholarship and creative achievement. This year's recipients include Billy U. Philips, Ph.D, M.P.H, who holds the F. Marie Hall Chair in Rural Health and is a distinguished professor in the School of Medicine. Renowned nationally for expertise in cancer control education, he has secured more than \$70 million in funding, spearheaded innovative telehealth initiatives, and established the first U.S. telehealth simulation lab. Recognized with accolades such as the Chancellor's Council Distinguished Research Award, Philips has been an advocate for students, holding various academic roles, including acting dean at TTUHSC's Julia Jones Matthews School of Population and Public Health.

Since 2008, Thomas J. Abbruscato, Ph.D., has served as the associate dean for Graduate School of Biomedical Sciences at the Amarillo campus and has held various positions, including departmental chair, with the Department of Pharmaceutical Sciences at the Jerry H. Hodge School of Pharmacy. With expertise in blood-brain barrier and transport, brain ischemia/stroke, and nicotine's neurovascular effects, Abbruscato has garnered more than 30 awards, including the TTUHSC President's Young Investigator Award in 2003 and multiple NIH-funded R01 grants. His impactful publications and global reputation as an expert have significantly elevated TTUHSC's standing nationally and internationally.

Cornwall Receives President's Research Award

Gail Cornwall, Ph.D., a professor in the Department of Cell Biology and Biochemistry at the TTUHSC School of Medicine, has focused her nearly 30-year career on studying male reproduction and sperm maturation. Cornwall, elected a Fellow of the American Association for the Advancement of Science in 2023, is a leader in the field of andrology with an established 25-year history of studying sperm maturation. She also is recognized for her discovery that amyloids, aggregated structures typically associated with Alzheimer's disease, carry out biological functions in the male germline and epididymis.

ACHIEVEMENTS AND ACCOLADES

TTUHSC's Cornwall, Srivastava Elected Fellows by American Association for the Advancement of Science

Paving a Smoother Path to Manuscript Publication: TTUHSC's West Texas Journal of **Medicine Provides a New Space for Peer-Reviewed Research**



SHANE HARPER. DMSC. PA-C

Launching a medical research journal and getting it into the orbit of the scientific community is a difficult proposition. TTUHSC's Shane Harper, DMSc, PA-C, discovered how difficult that task is when he became the founding editor-in-chief for the West Texas Journal of Medicine, which published its inaugural edition in December 2022 and its second issue in June 2023. By establishing a medical research journal, Harper and the journal's editorial board seek to provide an online publication that distributes original medical and health sciences-related research in a forum free of common predatory publication practices to a variety of multidisciplinary providers. In doing so, they are creating a credible resource for understanding and improving health care in the West Texas region and providing West Texas educators, scientists and clinicians with a venue to publish their scholarship. The journal also includes an image challenge section that will provide the reader with an image and a short synopsis. After evaluating the image, the reader is asked to describe what they think they are seeing before being provided an explanation.





GAIL CORNWALL, PH.D.



SANJAY K. SRIVASTAVA. PH.D.

Gail Cornwall, Ph.D., a professor in the Department of Cell Biology and Biochemistry at the TTUHSC School of Medicine, and Sanjay K. Srivastava, Ph.D., a professor and chair of the Department of Immunotherapeutics and Biotechnology at the TTUHSC Jerry H. Hodge School of Pharmacy, were named to the 505-member Fellowship Class of 2022 by the American Association for the Advancement of Science (AAAS). They were officially recognized at the 2023 AAAS Fellows Forum in Washington, D.C. The lifetime honor is based upon the nominee's scientifically or socially distinguished efforts to advance science or its applications. AAAS Fellows are nominated by their peers, and those considered by the AAAS Council to be scientifically distinguished are then elected to receive the honor. Cornwall is a leader in the field of andrology with an established 25-year history of studying sperm maturation. She also is recognized for her discovery that amyloids, aggregated structures typically associated with Alzheimer's disease, carry out biological functions in the male germline and epididymis. Srivastava, a University Distinguished Professor, has earned a reputation as a productive scientist over the last three decades. His selection as an AAAS Fellow recognizes his many contributions to the field of pharmaceutical sciences, including molecular pharmacology, cancer chemoprevention, cancer therapeutics, drug resistance and drug repurposing.



INSPIRING INNOVATORS

TTUHSC Teams Complete National I-Corps™ Training Program

The Texas Tech University System's Innovation Hub, located near the TTUHSC campus in Lubbock, offers ongoing opportunities whereby faculty form teams eager to learn how to take an innovation from the bench to the marketplace. These opportunities are available thanks to the National Science Foundation (NSF) Innovation Corps (I-Corps™) program. <u>Teams participating in</u> the NSF I-Corps[™] program receive comprehensive training designed to take them from innovation to impactful development that goes beyond the laboratory. I-Corps™ teams may be formed for the regional and national levels, though teams wishing to participate nationally must be recommended by a regional I-Corps[™] program such as the one available at the TTU System's Innovation Hub. During 2023, two teams from TTUHSC advanced from regional I-Corps™ programs to the national I-Corps™ program. One team, led by Hongjun (Henry) Liang, Ph.D., a professor in the Department of Cell

HONGJUN (HENRY) LIANG, PH.D

(Henry) Liang, Ph.D., a professor in the Department of Cell Physiology and Molecular Biophysics at the TTUHSC School of Medicine, is working to address antibiotic resistance using patented nanoparticles known as nanoantibiotics. The second team, led by assistant professor of surgery Alan Pang, M.D., is developing an algorithm-based system that will produce better treatment outcomes for burn victims.



PRESIDENTS' INNOVATIVE STARTUP AWARD WINNERS:

New American Fabric (NAF) received a \$25,000 award for their new selenium technology, which can be covalently attached to cotton, making the material antimicrobial yet safe for human use. Founders: Phat Tran, Ph.D., and Ted Reid, Ph.D., from TTUHSC and Noureddine Abidi, Ph.D., and Nick Bergfeld, M.D. from Texas Tech University.

MTDS Solutions received a \$15,000 award for their work on revolutionizing accessible testing by developing fully automated kiosks offering rapid send-out and PCR testing for the masses. Founders: TTUHSC alumna Michelle Coffey, APRN, Trey Keesee and TTUHSC faculty member Shannon Turnbow, M.D.

SciencePower Publishing House, LLC received a \$10,000 award for the development of GeneHub, a powerful website database that empowers physicians, researchers, students and patients to understand clinical genetics better. Founder: Tetyana L. Vasylyeva, M.D., Ph.D.

Red Raider Inventors

Those who have disclosed in FY2023 and have had 3 or more U.S. patents issued.

Lindsay Penrose, Ph.D. Ted Reid, Ph.D. Samuel Prien, Ph.D. Hemachandra Reddy, Ph.D.

Member Inventors

Those who have disclosed in FY2023 and have been named on a U.S. patent:

Phat Tran, Ph.D. C. Patrick Reynolds, M.D., Ph.D. Sanjay Srivastava, Ph.D. Murali Vijayan, Ph.D. Ina Urbatsch, Ph.D.



Associate Inventors

Those who have disclosed in FY2023 and have been a named inventor on a U.S. pending patent

Thomas Abbruscato, Ph.D. Hiranmoy Das, Ph.D. Min Kang, Pharm.D. Bryan Sutton, Ph.D. Laurence Wood, Ph.D. Susan Bergeson, Ph.D. Vardan Karamyan, Ph.D. Devon Lowe, Ph.D. Amanda McCormick Stephen Usala, M.D., Ph.D.

INNOVATE, COMMERCIALIZE, SUCCEED



2023 Emerging Inventor of the Year: Mahmoud Salama Ahmed, Department of Pharmaceutical Sciences, Amarillo

Dr. Ahmed develops drug discovery tools for structure-based drug design, organic synthesis, X-ray crystallography, and in vitro/in vivo biological evaluation to modulate different clinical diseases using small molecules.

2023 Deal of the Year: Sanjay Awasthi, M.D., and Sharda Singh, Ph.D., of Avesta 76 Therapeutics

This award is made in recognition of the significant time and research investment put toward the development of a robust portfolio of oncology therapeutics. The award also recognizes the dedication shown by Drs. Awasthi and Singh in moving these discoveries from the lab to the commercial market.



FY2023 TTUHSC Intellectual Property Highlights

36 Invention disclosures submitted (6 in collaboration with TTU faculty)

12 Provisional patent applications filed (3 in collaboration with TTU faculty)

40 Non-provisional patent applications filed (11 in collaboration with TTU faculty)

7 US patents issued

16 Licenses signed (6 in collaboration with TTU faculty)

17% of TTUS licensed revenue comes from TTUHSC

Source: Office of Research Commercialization

FY2023 Innovation Overview

Faculty and students often have ideas for products or services they want to commercialize to enhance the lives of people in our community. Innovation teams are formed around their idea and innovation programs are available in which they can participate. The data below details TTUHSC's 2023 innovation landscape

SANJAY AWASTHI. M.D.

73 TTUHSC innovators

49 TTU innovation collaborators

64 Innovation teams

13 Innovation programs offered

Source: Office of Research & Innovation - RICE

TTUHSC Secures National Academy of Inventors Membership

The National Academy of Inventors (NAI) has grown to more than 4,600 individual members worldwide from more than 300 U.S. and international colleges, universities, government agencies and non-profit research institutes. That growth continued in 2023 when TTUHSC became a NAI member, a milestone that highlights TTUHSC's entrepreneurial spirit and commitment to innovate health care. Later in 2023, NAI ranked the Texas Tech University System, including TTUH-SC, 75th among the Top 100 U.S. Universities Granted Utility Patents in 2022. NAI has published the Top 100 Worldwide Universities list annually since 2013, and created the new Top 100 U.S. Universities Granted Utility Patents list to highlight and celebrate American innovation, and to showcase the universities which play a large role in advancing the innovation ecosystem within the U.S. and beyond. NAI compiles its calendar-year Top 100 lists using data provided by the United States Patent and Trademark Office. This newest list is meant to provide a more focused view of the national innovation landscape and the contributions made by U.S. academic institutions. In 2023, P. Hemachandra Reddy, Ph.D., a professor in TTUHSC School of Medicine's Department of Internal Medicine who has researched healthy aging, dementia and other neurodegenerative diseases for more than 20 years, became the second TTUHSC inventor named an NAI Fellow (Samuel Prien, Ph.D., became the first in June 2022). Reddy has received three patents for his lab discoveries that promote healthy aging and identify mechanisms to detect and slow the progression of human Alzheimer's disease. He has several other patents pending.



OFFICE OF RESEARCH DIVISIONS OF SUPPORT



Laboratory Animal Resources Center (LARC) LARC oversees and supports the procurement, housing, health and welfare of research animals at TTUHSC facilities in Lubbock. Amarillo and Abilene.



Research Innovation, Collaboration, **Entrepreneurship (RICE)**

RICE empowers and fosters a collaborative, innovative and dynamic research environment to cultivate advanced scholarship, innovation and entrepreneurial opportunities.



Office of Sponsored Programs (OSP) OSP assists and supports faculty and staff in identifying and obtaining funding opportunities through grants and contracts as well as promotes the successful management of awarded projects.



Research Integrity Office (RIO)

RIO empowers the TTUHSC research community to act with the highest ethical standards and to maintain a culture of ethics compliance and integrity in all that we do.

TTUHSC: RESEARCH OVERSIGHT COMMITTEES

Through committees, TTUHSC oversees research to ensure compliance with state and federal laws and institutional policies. The effectiveness of these committees relies heavily on the dedication and contributions of the individuals listed below:

The Institutional Review Board (IRB) monitors all TTUHSC research involving human subjects. The board evaluates risks to subjects and compliance with federal regulations and institutional policies.

- Amarillo IRB Chair: Ronald Hall II, Pharm.D. (1 year of service in this role)
- in this role: 15+ years with the IRB)
- the IRB)

safe use, handling and storage of hazardous chemical and biological materials.

• IBC Chair: Abraham Al-Ahmad, Ph.D. (3 years of service in this role)

· QIRB Chair: Cindy Acton, DNP, R.N. (2+ years in this role)

Embryonic Stem Cell Research Oversight Committee (ESCRO) provides local oversight of standards and responsible use of human embryonic stem cells (hESC) or human Pluripotent Stem Cells (hPSC) in research.

• ESCRO Chair: Clinton C. McDonald, Ph.D. (7+ years of service in this role)

Institutional Animal Care & Use Committee (IACUC) oversees federally-mandated policies and procedures regarding the humane care and use of lab animals.

• The Office of Research and Innovation thanks the chair and vice chair for their service.

· Amarillo IRB Vice-Chair: Amy Choate, R.Ph. (Northwest Texas Healthcare System) (4 years of service

• Lubbock IRB Chair: Scott O'Banion, Pharm.D. (5 years of service in this role; 10+ years with the IRB) • Lubbock IRB Vice-Chair: Rebecca Sleeper, Pharm.D. (5 years of service in this role; 10+ years with

Institutional Biosafety Committee (IBC) develops and advises on standard policy and procedures for the

- Quality Improvement Review Board (QIRB) oversees the systematic collection and analysis of data and implementation of interventions to improve the quality of clinical care in our educational programs.

LEADERSHIP



ALYCE ASHCRAFT, PH.D., R.N. Associate Dean for Research and Scholarship School of Nursing



MICHAEL BLANTON, PH.D. Associate Vice President for Research Senior Associate Dean, Graduate School of Biomedical Sciences



PHIL SIZER JR., PT., PH.D. Associate Vice President for Research Innovation



LESLIE SHEN, PH.D. Associate Dean for Research School of Medicine





KATIE JOPLIN Assistant Vice President for Finance and Administration



ERIN WOODS, M.R.A. Associate Vice President for Sponsored Programs

KRISTYN SORENSEN, J.D., PH.D.

Associate Vice President for Research Integrity





ULRICH BICKEL, M.D. Associate Dean of Science Jerry H. Hodge School of Pharmacy



MIN KANG, PHARM.D. Associate Vice President for Research and Innovation



Dedicated to the memory of Steven L. Berk, M.D. TTUHSC School of Medicine Dean Executive Vice President for Clinical Affairs MARCH 12, 1949 – MAY 26, 2023



TEXAS TECH UNIVERSITY HEALTH SCIENCES CENTER

Office of Research & Innovation Suite 2B306 | 3601 4th Street Lubbock, Texas 79430 806.743.3600 | researchoffice@ttuhsc.edu