ANNUAL REPORT

2021

TEXAS TECH UNIVERSITY
HEALTH SCIENCES CENTER™

Garrison Institute on Aging

TABLE OF CONTENTS

MISSION AND VISION

Our mission is to promote healthy aging through cutting-edge research in aging-related health issues, such as Alzheimer's disease, and through innovative educational and community outreach programs. The Garrison Institute on Aging (GIA) is committed to addressing health issues of the aging population by investigating the causes of neurodegenerative diseases and educating the community on preventative medicine and challenges impacting the geriatric population.

Scientists at the GIA are actively working to identify disease mechanisms and novel targets to prevent or mitigate neurodegenerative and other aging-related diseases. In addition to research facilities for behavioral assays, electrophysiology and molecular biology, the GIA houses biobanks for human brain tissue, bodily fluids, and DNA. The GIA-based Project FRONTIER (Facing Rural Obstacles to Healthcare Now Through Intervention, Education & Research) is a laboratory- and community-based longitudinal study designed to investigate the prevalence and risk factors of dementia among rural residents. Educational and outreach programs include the Translational Research Seminar Series, Annual Research Symposium, Healthy Aging Lecture Series, Caregiver Partner Academy, Retired and Senior Volunteer Program (RSVP), and Chronic Disease Self-Management Program.

Our vision is to serve as the central hub within Texas Tech University Health Sciences Center (TTUHSC) to stimulate innovative and collaborative initiatives in research, interdisciplinary education and community outreach related to healthy aging and aging-related disorders through a combination of GIA based programs and partnerships across TTUHSC.

MESSAGE FROM PROVOST

Darrin D'Agostino,
DO, MPH, MBA

The Garrison Institute on Aging began as a strategic initiative during a time when our population in the United States was growing older and it was clear the United States did not have enough health care services to keep people healthy as they age. TTUHSC identified this need and focused attention to one of our most precious resources, our elders.

Dr. Volker Neugebauer has led his team in discovery and education enhancing the lives of our aging communities. Recognized nationally and internationally, our research and clinical programs focus on the aging process and help explain why we age the way we do leading to strategies, therapeutics, and interventions that help us stay healthy, prevent disease, and keep joy in our lives. We are proud to share what we learn with others through community engagements, lectures and in the scientific literature, but we are especially proud to enhance the education of our students as we grow the next generation of care givers.

Shirley and Mildred Garrison, and many other visionaries, have partnered with TTUHSC and our amazing team of faculty and staff to make our communities healthy. Together, we are transforming health care through innovation and collaboration.

MESSAGE FROM EXECUTIVE DIRECTOR
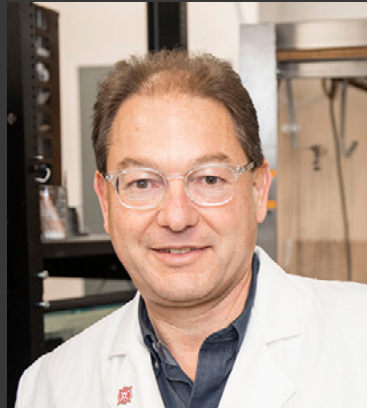
Volker Neugebauer,
MD, PhD

The Garrison Institute on Aging (GIA), established in 1999 by the Board of Regents as the Institute for Healthy Aging, is well-aligned with the new vision at Texas Tech University Health Sciences Center (TTUHSC) to transform health care through innovation and collaboration. Our mission and goals are to improve the quality of life of the aging population through innovative and collaborative programs in research, community outreach and education. The GIA strives to serve as the hub for initiatives on aging and aging-related disorders and conditions across TTUHSC. As such we are well-positioned to provide the TTUHSC platform for pursuing extramural support from funding agencies such as the NIH National Institute on Aging, which "seeks to understand the nature of aging and the aging process, and diseases and conditions associated with growing older, in order to extend the healthy, active years of life" (www.nia.nih.gov/about/mission).

Our research programs comprise basic preclinical research and studies in humans. Preclinical research aims to determine causes of Alzheimer's disease (AD) and other forms of dementia and neurodegenerative disorders and to identify therapeutic targets. After restructuring the laboratories and overcoming the challenges posed by the COVID-19 pandemic, we continued our research on mitochondrial dysfunction in AD, and generated exciting new data from human AD brains and rodent AD models that show dysfunction of molecules that provide structural and functional organization of neural signaling elements, which may be an early driver of AD

pathology. GIA member Dr. Josh Lawrence received a fundable score for his NIH R01 grant application to explore the protective role of retinoic acid signaling in AD pathogenesis. A new collaboration with Texas Tech University was established to measure protective effects of fish oil and underlying mechanisms. Several collaborative research projects created through the GIA Collaborative Seed Grant Program in Aging continued; they involve preclinical research and studies in humans. Project FRONTIER (Facing Rural Obstacles to Healthcare Now Through Intervention, Education and Research) collects epidemiological data on cognitive health and aging in a multiethnic adult sample from rural communities of West Texas. We included an assessment of participants' perceptions and experiences related to COVID-19, which revealed disparities in access to COVID-19 testing, COVID-19 cases and fatalities among urban and rural communities. Project FRONTIER data provided the basis for collaborative studies, student research projects, and grant applications.

The GIA Brain Bank continues to provide a valuable service to the families of patients with AD and other forms of dementias through free brain autopsies for a definitive diagnosis. The Brain Bank also offers important resources for research and education, serving the educational mission of GIA to inform students and trainees about AD and aging, and facilitating research by identifying factors that may predict onset and severity of AD and through the molecular analysis of brain tissues. We have made improvements to the protocols for obtaining, preserving and analyzing brain tissues. Quality (RIN) analysis determined that at least half of our brain samples are suitable for molecular research.

GIA Community Outreach and Education strives to assist and educate the community on preventative medicine and challenges impacting the geriatric population. This is done through education, awareness, surveys, self-management, volunteer and other programs on AD and aging-related health issues. The GIA staff implemented virtual platforms for educational activities and learning opportunities, which include the Retired and Senior Volunteer Program (RSVP), Healthy Aging Lecture Series, Healthy Lubbock Initiative, Care Partner Academy, Caregiver Conference, events for National Alzheimer's Disease and Awareness Month. The GIA also co-sponsored the Translational Neuroscience and Pharmacology Seminar Series and the Annual Symposium on "Aging-Related Health Issues and Alzheimer's Disease" with key note speaker Dr. Eliezer Masliah, Director, Division of Neuroscience, NIH. The GIA also provided research opportunities for students in the Medical Summer Student Research Program.

The GIA Team proudly mastered the various challenges related to the COVID-19 pandemic. We look forward to continuing and expanding our activities to serve the GIA mission and goal as a central hub within TTUHSC for collaborative initiatives in research, education, and community outreach related to healthy aging and aging-related disorders.

Much appreciation and gratitude to all of our collaborators across the departments and schools at TTUHSC and TTU, to the Laboratory Animal Resources Center (LARC) team, the Office of Research and Office of Sponsored Programs, the Office of External Relations, to the Provost and President, and the Dean of the School of Medicine for all their valuable support. We would like to take this opportunity to welcome our new Provost, Dr. Darren D'Agostino, who already engaged with our Team to collect information and provide guidance and support. Last but not least, we are immensely grateful for the generous support and continued commitment of the Garrison Family to the mission and vision of our Institute.

FACULTY AND STAFF
RESEARCH DIVISION

Divya Burugu, MS
Research Scientist

Volker Neugebauer, MD, PhD
Executive Director and Chief Scientific Officer, Garrison Institute on Aging, Mildred and Shirley L. Garrison Chair in Aging, Professor and Chair, Pharmacology and Neuroscience
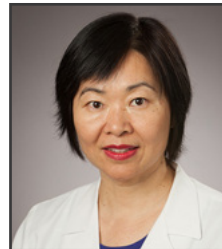
Ruben Gonzales
Senior Director

Kandi Quesada, MPH
Associate Director, Finance

J. Josh Lawrence, PhD
Associate Professor, Pharmacology and Neuroscience

Linda Yin, MS
Senior Research Associate

Maria Manczak, PhD
Research Assistant Professor
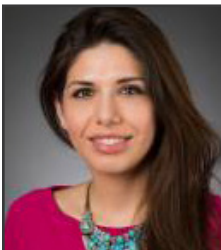
FACULTY AND STAFF

COMMUNITY OUTREACH AND EDUCATION DIVISION

Cordelia Aguirre
*Coordinator,
Project FRONTIER*

Annette Boles, MS
*Director, Community
Outreach and Education*

**Gabriela Ashworth,
PhD**
*Research Assistant
Professor,
Pharmacology
and Neuroscience;
Manager, Grants and
Publication*

Veronica Lopez
*Unit Manager,
Community Outreach
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**Joan Blackmon,
MBA**
*Specialist IV,
Community Outreach
and Education*

Susan Thompson
*Coordinator, Community
Outreach and Education*

FACULTY AND STAFF

RESEARCH COLLABORATORS

Gail A. Cornwall, PhD
Professor, Cell Biology and Biochemistry

Igor Ponomarev, PhD
Associate Professor, Pharmacology and Neuroscience

Josee Guindon, DVM, PhD
Assistant Professor, Pharmacology and Neuroscience DVM Veterinary

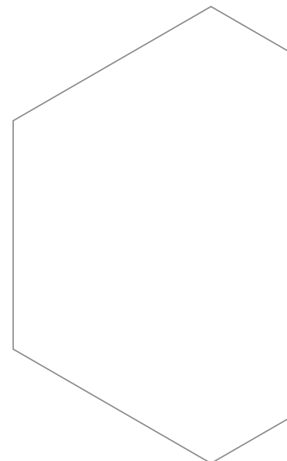**Kevin Pruitt, PhD**
Associate Professor, Immunology

Andrey Karamyshev, PhD
Assistant Professor, Cell Biology and Biochemistry Russian Academy of Sciences

Jonathan Singer, PhD
Assistant Professor, Clinical Psychology

Naima Moustaid-Moussa, PhD
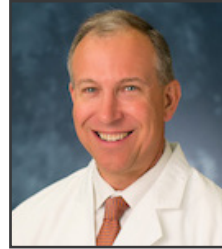*Professor, Nutritional Sciences and Director, Obesity Research Institute*

FACULTY AND STAFF

CLINICAL AND PROJECT FRONTIER COLLABORATORS

Duke Appiah, PhD
Assistant Professor, Department of Public Health

John Culberson, MD
Associate Professor, Family and Community Medicine Bernard T. Mittemeyer, M.D., Endowed Chair in Medical Excellence in Geriatric Medicine Director, Garrison Institute on Aging, Clinical Geriatric Programs

Alyce Ashcraft, PhD, RN, CNE, FNGNA, ANEF
Professor and Associate Dean for Research and Scholarship, University Distinguished Professor, Glenna Roberts Endowed Practiceship in Nursing

John DeToledo, MD
Vernon and Elizabeth Haggerton Chair in Neurology, Professor and Chair, Department Chairperson, Neurology

Theresa Byrd, DrPH, MPH, RN
Chair, Department of Public Health. Associate Dean, Graduate School of Biomedical Sciences

Parunyou Julayanont, MD
Corinne Payne Wright Regent Endowed Chair in Alzheimer's Disease, Assistant Professor of Neurology, Department of Neurology, Director, Behavioral and Cognitive Neurology Clinic

COLLABORATIVE RESEARCH

FACILITIES, PROJECTS, SCHOLARLY ACTIVITIES AND RESEARCH HIGHLIGHTS

BASIC RESEARCH FACILITIES TO ENHANCE RESEARCH AND COLLABORATIONS

The restructured and upgraded GIA laboratories include a molecular facility to study molecular mechanisms of brain changes in AD and aging conditions, an electrophysiology facility for the analysis of neural networks in ex vivo brain tissues, and a behavioral facility for the comprehensive study of cognitive, affective, sensory, and motor aspects of behavior in AD and aging conditions.

- **Behavioral facility** is managed by Linda Yin, and has equipment for motor deficit screening exploratory and anxiety related behavioral assessments, and associative, reference, procedural and working memory as well as behavioral flexibility testing. Most of our systems are Noldus based, and where relevant infrared backlit, employing an automated means for precise and accurate data collection. Standard operating protocols and training for use of equipment are available.

- **Molecular laboratory** is managed by Maria Manczak, PhD, and has equipment for protein study, DNA and RNA analysis, immunohistochemistry, and cell culture. Recently, a new fluorescent microscope with upright and inverted capability (Revolve Microscopy System) and a Real-Time PCR System (Applied Biosystems QuantStudio 7 Pro) were purchased.

- **Electrophysiology laboratory** is managed by J. Josh Lawrence, PhD, and has equipment for brain slice physiology, including a Luigs and Neumann Infrapatch electrophysiology rig and a Scientifica electrophysiology rig. Both are equipped with Zeiss Axio Examiner upright microscopes and with components to integrate recording from fluorescent neurons and optogenetic stimulation. Additional equipment is for brain dissection, preparation of brain slices, and manufacturing recording electrodes.

• **Common laboratory areas include** the cell culture facility and interventional room for stereotaxic and other surgeries.

COLLABORATIVE RESEARCH PROJECTS ON AGING AND ALZHEIMER'S DISEASE

(Names of GIA members are underlined)

PRECLINICAL STUDIES

Reduced mitochondrial fission protein DRP1 and Mitophagy in Alzheimer's Disease
(NIH R21 grant; Principal Investigator: Maria Manczak, PhD, GIA, SOM)

The purpose of this study is to understand the correlation between mitochondrial fission protein dynamin-related protein 1 (Drp1) and mitophagy system in Alzheimer's disease (AD), because mitochondrial dysfunction may affect mitophagy and play a pivotal role in AD pathogenesis and progression. We explored in this project the protective effects of reduced Drp1 and the adverse effects of overexpressed Drp1 on mitophagy in Tau transgenic mice. We bred transgenic Tau(P301L) mice (AD model) and knockdown Drp1+/- mice and we are also co-bred Tau and Drp1+/- mice to determine the role of reduction of mitochondrial fission DRP1 protein in preventing the progression of AD. We examined the effect of overexpression of Drp1 in WT and Tau mice on mitophagy, using adeno-associated viral approach. We studied quality and health of mitochondria and mitophagy pathway by measuring mitochondrial biogenesis, dynamics, autophagy/mitophagy genes expression, protein levels and mitochondrial function by measuring ATP and ROS production. We also tested mitochondrial structure by EM. We determined the effect of reduction and overexpression of Drp1 on autophagy to remove hyperphosphorylated tau, and on mitophagy to remove dysfunctional mitochondria. Our data showed that mitochondrial fission, which requires Drp1, is essential for segregation of damaged mitochondria for degradation and plays an important role in mitochondrial quality control. In the final part of this study, we will seek to determine if endogenous Drp1 plays an important role in mediating mitophagy in response to Tau-pathology.

Global gene expression profiling of high fat and fish oil effects in a mouse model of Alzheimer's disease
(COHS AD Seed Grant; Principal Investigators: Naima Moustaid-Moussa, PhD, TTU, and Volker Neugebauer, MD, PhD, GIA, SOM, GSBS)

The goal of this study is to test if fish oil has protective effects in an Alzheimer's disease mouse model by reducing brain, adipose tissue and systemic inflammation and decreasing amyloid beta accumulation. Adipose tissue, brain and other tissues from obese wild type and APP transgenic mice fed with fish oil for 8 months will be analyzed. Lipidomics and genomics will be used to identify potential mechanisms.

Impact of mitochondrial fission protein DRP1 on autophagy/mitophagy pathway under tauopathy conditions
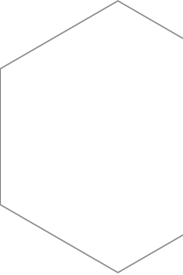
(GIA collaborative seed grant; Principal Investigator: <u>Maria Manczak, PhD, GIA, SOM</u>; Co-Investigator: Igor Ponomarev, PhD, SOM, GSBS; Research team: <u>Linda Yin</u> and <u>Divya Burugu</u>)

This project analyzed autophagy/mitophagy pathways that are responsible for accumulation of phosphorylated Tau and dysfunctional mitochondria in a Tau-based Alzheimer's disease cell model (human neuroblastoma SH-SY5Y cells transfected with human mutant Tau cDNA clone). We explored three different mitophagy pathways (Pink1 dependent, Parkin1-dependent, and Pink1/Parkin1-dependent). The first goal of this study was to explore mitophagy pathways that are responsible for eliminating the accumulation of phosphorylated Tau and damaged mitochondria, and maintain good mitochondrial functioning through a tight mitochondrial quality control in the AD cell model. The second aim of this project was to study the role of Drp1 (dynamin-related protein 1) in autophagy/mitophagy signaling in the AD cell model and determine if reduction of Drp1 promotes initiation of autophagy/mitophagy pathways and clearance of pathological Tau species. We studied expression of mitochondrial, autophagy/mitophagy genes and protein levels, and mitochondrial condition after overexpression of mitophagy protein in mutant-Tau SH-SY5Y cell culture. Our data showed that different mitophagy pathways involve different mitophagy receptors and adaptors. After completion of the study we can uncover the exact role of mitophagy and mitophagy-related genes in pathological conditions, how many proteins are involved in the regulation of mitophagy, and what type of mitophagy plays a critical role in removing of dysfunctional mitochondria.

Host defense amyloids in the brain

(GIA collaborative seed grant; Principal Investigators: Gail Cornwall, PhD, SOM, GSBS; Co-Investigator: Hemachandra Reddy, PhD, SOM, GSBS)

This project tests the hypothesis that a constitutively produced complex functional amyloid matrix composed of multiple antimicrobial protein/peptide amyloids and

amyloidogenic precursors, including several cystatins and APP/Aβ, is a normal extracellular structure throughout the brain. Perturbations in this amyloid matrix, caused by a loss/imbalance in matrix components or as a result of a response to pathogens or injury, can lead to AD and other neurodegenerative diseases. Specially, experiments are designed to determine if a CRES (cystatin-related epididymal spermatogenic)/cystatin C amyloid matrix, including APP/Aβ, is in the mouse and human brain.

Role of aberrant Wnt/Ca2+ signaling in Alzheimer's disease and cancer
(GIA collaborative seed grant; Principal Investigators: Kevin Pruitt, PhD, SOM, GSBS, and Josh Lawrence, PhD, GIA, SOM, GSBS)

Aberrant Wnt signaling is well-recognized as a driver of tumorigenesis, and more recently has been implicated in age- and AD-related synaptic dysfunction. A transcriptomic screen of total RNA of hippocampal dentate gyrus (DG) tissue in the J20 AD mouse model revealed dysregulation of the Wnt/Ca2+ signaling pathway. Preliminary data show that treatment of J20 AD mice with retinoic acid (RA) normalized Wnt-Ca2+ signaling and AD-related behaviors, suggesting that stimulation of nuclear RA receptors restores Wnt-Ca2+ signaling. This project tests several novel hypotheses: 1) Age- and AD-dependent dysregulation of Wnt-related cellular differentiation factors impair cognition, accelerate AD pathogenesis, and elevate cancer risk, 2) Wnt/Ca2+ signaling is disrupted during AD pathogenesis, and 3) stimulation of RA receptors restores Wnt/Ca2+ signaling, reduces synaptic impairment, and reduces risk of tumorigenesis. Specific aims are designed to validate and extend these molecular pathway findings.

Role of mitochondrial dysfunction in changing inflammatory factors in aging mice subjected to chemotherapy-induced pain sensitivity
(GIA collaborative seed grant; Principal Investigator: Josee Guindon, DVM, PhD, SOM, GSBS; Co-Investigators, Maria Manczak, PhD, SOM, GIA, and John Culberson, MD, SOM)

In this study we will determine if decrease and delay in chemotherapy-induced pain sensitivity (CIPS) in aging mice occurs through mitochondrial dysfunction. Mitochondrial dysfunction is one of the hallmarks of aging. Dysfunctional mitochondria in aged mammals exhibit a diminished capacity for ATP production, increase reactive oxygen species (ROS) production, decreased membrane potential, loss the balance in mitochondrial fission and fusion cycles. This project will establish the role of mitochondrial dysfunction in

the changes of ROS production that modulate pronociceptive factors leading to delayed and decreased chemotherapy-induced pain sensitivity in aging mice. Time-dependent decreased and delayed CIPS was found in aged mice relative to chemotherapy treatment in younger male mice.

Transcriptional Dysfunction in Dentate Gyrus Cell Types: Roles of Retinoic Acid Responsive Genes in Protection Against Alzheimer's Disease Pathogenesis
(NIH/NIA R01 grant – within NIA payline; Principal Investigator: Josh Lawrence, PhD, GIA, SOM, GSBS; Co-Investigator, Maria Manczak, PhD, GIA, SOM).

This research project will study the role of all-trans retinoic acid (ATRA), the active form of retinol, in the hippocampal dentate gyrus (DG) in the protection against Alzheimer's disease (AD). ATRA has a dual role in reactive oxygen (ROS) scavenging and transcriptional control of synaptic/neuronal proteins via its function as a retinoic acid receptor (RAR) agonist. The central hypothesis will be tested that ATRA depletion in the DG is an early event in AD pathogenesis, leading to oxidative stress, mitochondrial dysfunction, and loss of transcriptional control of RAR-sensitive genes in DG cell types, which can be accelerated or delayed by bidirectionally manipulating DG ATRA levels. excess ROS-induced damage. An innovative multidisciplinary approach will be used that uniquely combines DG-dependent learning paradigms, single cell transcriptomics, and cellular/synaptic analysis in two AD mouse models to determine how bidirectional manipulation of ATRA levels alters transcriptional control of RAR-sensitive genes across DG cell types and impacts DG-dependent learning and cellular/synaptic function. Successful completion of this project will reveal novel mechanisms of DG-related learning impairments in AD and discover new AD biomarkers in specific cell types indicative of ATRA deficiency.

Trans-synaptic signal complex in Alzheimer's disease models
(Collaborative project; Principal Investigators: Volker Neugebauer, MD, PhD, GIA, SOM, GSBS, Maria Manczak, PhD, GIA, SOM, Shashank Dravid, PhD, Creighton University)

Trans-synaptic protein complexes play an important role in the development, maintenance and plasticity of synapses and neural signaling. We are testing the hypothesis that early onset changes in the expression of these synaptic organizer molecules may be involved with pathophysiology of Alzheimer's disease (AD). We found gene expression changes of several molecules in human brain tissue and in AD mouse models, which will be correlated with the clinical diagnoses in human

subjects and behavioral changes in animals. Mechanisms of interactions with AD pathology such as amyloid β-protein (Aβ) will be explored. Strategies will be tested to mitigate these changes. The better understanding of synaptic mechanisms that drive pathology in AD may help develop more efficacious therapeutics for AD.

HUMAN STUDIES

"Project FRONTIER Participant Assessment of COVID-19" (see also Project FRONTIER) (TTUHSC Project FRONTIER funding; Principal Investigators: Gabriela Ashworth, PhD, GIA, SOM, and Volker Neugebauer, MD, PhD, GIA, SOM, GSBS; Research Team: Annette Boles, MS, Veronica Lopez, Susan Thompson and Cordelia Aguirre)

Currently, there is no prior assessment being conducted in rural West Texas communities focused on COVID-19, which has had far-reaching disastrous effects in terms of death and disease. This research is important for understanding residents' experiences and challenges, and informing public health and health care leaders in leading preparedness efforts in these areas. The aims of this study are to: 1) learn how rural residents in West Texas are experiencing COVID-19. 2) understand what preventive measures (during the COVID-19 pandemic) are been taken by residents. 3) assess perceptions about resources and services (i.e., telehealth) that are available in rural communities. To achieve these aims, research staff at the GIA are administering a telephone survey to persons who agreed to be re-contacted for future research in the Project FRONTIER Study. Respondents live across the 4-county study area of Project FRONTIER: Bailey County, Cochran County, Hockley County, and Parmer County. Lubbock County residents have been included for an urban-rural comparison of residents' experiences with COVID-19. Findings reveal disparities in COVID-19 experiences (testing, cases, fatalities) among urban and rural communities, which call for strategies aimed at improving healthcare access in rural areas through telemedicine and other innovative approaches.

Biopsychosocial predictors of cognitive stability, decline, and resilience in a sample of older, rural-dwelling West Texans: A retrospective cohort study using data from Project FRONTIER (GIA collaborative seed grant; Principal Investigator: Gabriela Ashworth, PhD, GIA, SOM; Co-Investigators: Duke Appiah, PhD, GSBS, and Annette Boles, MS, GIA)

This is serum-based Project FRONTIER cohort study exploring biopsychosocial risk factors on cognitive progression status: (1) cognitive stability, (2) cognitive resilience, and (3) cognitive decline. In this study, the serum samples from the

Frontier longitudinal study that belong to subjects in Cochran and Palmer counties were validated for the protein biomarkers (p-Tau, BDNF, Aβ42, Aβ40, sAPPβ, sAPPα, BACE 1) of AD. A total of 120 subjects (n=60 Cochran and n= 60 Palmer) were measured in this study. Results from this research are expected to provide insight into the development of diagnostic or therapeutic strategies for AD.

Mind your heart: the association of heart/vascular aging with mild cognitive impairment using data from Project FRONTIER

(GIA collaborative seed grant; Principal Investigators: Duke Appiah, PhD, GSBS, and Gabriela Ashworth, PhD, GIA, SOM; Co-Investigators: Nandini Nair, MD, PhD, SOM, and Annette Boles, MS, GIA)

Cognitive disorders such as Alzheimer's disease-related dementias (ADRD) share several pathophysiological pathways with cardiovascular disease CVD, such as inflammation, increased oxidative stress, and changes to nitric oxide bioavailability. The burden of CVD and ADRD disproportionately affects rural communities. With rural communities having limited access to care, coupled with low health literacy rates, identifying preventive measures that will reduce both CVD, ADRD and cognitive impairment through CVD risk factor modification cannot be overstated. Identifying low-cost strategies to effectively communicate CVD risk with the aim of influencing behavioral change to prevent CVD and cognitive impairment remain a high priority. An intuitive means of quantifying and communicating CVD risk is the concept of predicted heart/vascular age (PHA). However, no studies to date have estimated PHA in rural settings especially among minority populations like Hispanics. The first step in informing public health policy makers in adopting this low-cost measure to prevent MCI is to show that PHA is related to MCI. Therefore, we intend to address the following aims using data from Project FRONTIER, a cohort study of rural West Texas residents. 1) To Investigate the association of PHA with MCI. 2) To evaluate the role of ethnicity in changes in cognition due to PHA. 3) To assess the influence of sociodemographic and lifestyle-related factors on excess PHA. 4) To develop a statistical algorithm to predict MCI considering PHA, biomarkers and other factors pertinent to rural communities. The proposed project will offer an unprecedented cost-efficient opportunity to understand the potential relation of an intuitive tool (PHA) for the prevention of MCI.

Alzheimer's disease and urinary tract infection: nursing home workflow encompassing CNA, LVN, and PCP communication

(GIA collaborative seed grant; Principal Investigators: Alyce Ashcraft, PhD, SON, Donna Owen, PhD, SON, and John Culberson, MD, SOM; Research Team: <u>Annette Boles,MS, GIA</u>)

Between 2015-2016 the prevalence of Alzheimer's Disease (AD) and other cognitive impairments in US nursing homes (NH) was reported to be nearly 60% of residents staying longer than 100 days. Urinary tract infections (UTI) is one of the top three diagnoses in NH residents leading to an avoidable trip to the emergency department. Over 25% of avoidable hospitalizations could be prevented by better communication, and 16% of avoidable hospitalizations of NH residents with symptoms of a UTI could have been prevented with better communication between nurses and PCPs. Effective communication can be improved with technology but technologic innovations for NH communication does not work mainly because testing of the intervention fails to consider the workflow of the environment. This project examines the workflow surrounding the assessment of NH residents with suspected UTI to establish baseline data. We will determine how Licensed Vocational Nurses (LVNs) typically collect data about residents with a change in condition and how they convey this information to an off-site Primary Care Provider (PCP). We will create a diagram of baseline workflow about LVN data collection and their communication with PCPs that will be used to examine the feasibility of our newly developed Clinical Decision Support application (CDS app) that is designed to guide LVNs in data collection and improve communication confidence and satisfaction between LVN and PCP. Data from our proposed workflow study will provide us with baseline data that will allow us to make comparisons between what LVNs do with and without technology. We will be able to compare the impact of the CDS app on NH workflow with baseline workflow that does not involve the CDS app or other technology.

STUDENT RESEARCH OPPORTUNITIES

GIA members participated in the Medical Student Summer Research Program (MSSRP) by mentoring medical students.

Seham Azzam (GIA Mentors, Drs. Maria Manczak and Volker Neugebauer)
Approaches to the analysis of mitochondria dysfunction and mitophagy impairment in the brains of AD patients.

Cortex tissue from post-mortem brains of AD patients and a control group from Kentucky Brain Bank was used. First, expression of mitochondrial biogenesis and mitochondrial dynamics genes was analyzed, using extraction RNA, synthesis cDNA and qRT-PCR methods. Mitochondria dysfunction is a huge negative contributor to age-related diseases like AD. The second part of our project studied mitophagy, which is important to maintain a healthy mitochondrial population in neurons because neurons have an exceptionally high demand for ATP. Gene expression of mitophagy, mitophagy receptors and autophagosome receptors were measured in the human brain.
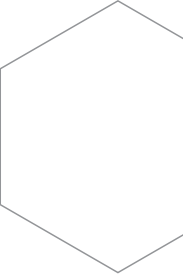
Benjamin Johnson (GIA Mentors, Dr. Volker Neugebauer, Linda Yin, and Divya Burugu)
Trans-synaptic neural signaling in aging and neurodegenerative diseases. In Alzheimer's disease (AD) there are changes in synaptic communications that are hypothesized to be an early mechanism of the neurodegenerative properties associated with the disease. Synaptic organizers such as transsynaptic signaling complexes play an important role in synaptic development and maintaining the integrity of the synapses in the brain. The goal of this project was to investigate if cognitive deficits seen in AD models can be mitigated by injecting elements of the transsynaptic signaling complex into brain regions where deficits are detected. Following injection, a series of behavioral assays was to investigate beneficial effects of the injection. Expression of genes and proteins associated with the transsynaptic signaling complex were measured. These experiments allow the assessment of changes and rescue strategies at different disease stages in AD models.

Joey Almaguer (GIA Mentor, Dr. Josh Lawrence)
Depletion of all-trans retinoic acid (ATRA), the transcriptionally active form of vitamin A, is suggested to contribute to Alzheimer's disease (AD) pathogenesis. Hepatic stellate cells are known to be storage reservoirs for vitamin A. This project explored the new concept that liver dysfunction (i.e. through alcoholic liver cirrhosis, hepatosteatosis, chronic liver fibrosis, and/or hepatitis C virus) accelerates the homeostatic collapse of

ATRA availability, contributing to brain ATRA insufficiency and an accelerated cognitive decline in human AD. Aims were designed to strengthen links between ATRA deficiency, cognitive decline, liver dysfunction, and AD pathogenesis. 1) Determine which ATRA-sensitive genes and molecular pathways are dysregulated in human AD. 2) Determine relationships between liver dysfunction and accelerated/advanced cognitive decline in human AD using blood-based liver biomarkers and RBANS. 3) Explore mechanistic relationships between Apolipoprotein E (APOE) e4 status and ATRA signaling. 4) Explore the mechanistic role of ATRA signaling in the maintenance of cAMP and phosphodiesterase levels in human AD and AD mouse models. This work provides a more comprehensive understanding of the role of ATRA signaling in AD pathogenesis that could be targeted for future drug therapy.
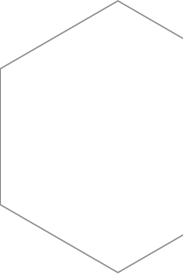
STUDENT RESEARCH OPPORTUNITIES

• NIH/NINDS R01 NS120395 "A prolactin-mediated neuroendocrine link between stress-induced latent sensitization and female-selective pain", 08/01/20 – 07/31/25, Drs. Volker Neugebauer (GIA, SOM) and Frank Porreca (University of Arizona).

• USDA/NIFA 2021-67017-34026 "Ginger root extract for neuropathic pain", 01/01/21 - 12/31/23, Drs. Volker Neugebauer (GIA, SOM), Chwan-Li (Leslie) Shen (SOM).

• NIH/NINDS R01 NS118731 "Trans-Synaptic Signaling Complex in Amygdala Pain Mechanisms", 08/01/20 – 07/31/25, Drs. Volker Neugebauer (GIA, SOM) and Shashank Dravid (Creighton University).

• NIH/NINDS R01 NS109255 "Pronociceptive and Antinociceptive Opioid Mechanisms in the Central Nucleus of the Amygdala", 08/15/19 – 06/30/24, Drs. Guangchen Ji (SOM) and Edita Navratilova (University of Arizona); Dr. Volker Neugebauer PI (GIA, SOM; Co-Investigator).

• NIH/NIAAA R01 AA027096 "The Neuroimmune Model of Excessive Alcohol Consumption: Transition to Alcohol Use Disorder", 07/01/19 - 06/30/23, Drs. Igor Ponomarev (SOM); Dr. Volker Neugebauer (GIA, SOM; Co-Investigator).

• NIH/NINDS R01 NS106902 "Stress-Induced Descending Facilitation from Amygdala Kappa Opioid Receptors in Functional Pain", 04/01/18 - 03/31/23, Drs. Volker Neugebauer (GIA, SOM) and Frank Porreca (University of Arizona).

• NIH/NINDS R01 NS038261 "Amygdala Pain Mechanisms", 12/01/16 - 11/30/21, Dr. Volker Neugebauer (GIA, SOM).

• Center of Excellence for Translational Neurosciences and Therapeutics PN-CTNT 2018-12 LSVNBAW "Tai Chi for Pain Management: A Pilot Mechanistic Study", 12/01/18 - 12/31/21, Drs. Volker Neugebauer (GIA, SOM), Chwan-Li (Leslie) Shen (SOM).

• "Novel drug for the treatment of neurodegenerative and neuroinflammatory changes in multiple sclerosis", Drs. Volker Neugebauer (GIA, SOM), Maria Manczak (GIA, SOM), Guangchen Ji (SOM), Mirla Avila (SOM), Nadia German (SOP).

STUDENT RESEARCH OPPORTUNITIES

• NIH/NINDS "Neuroendocrine Consequences of Neonatal Medical Trauma", submitted 09/07/21, Dr. Volker Neugebauer, PI Subcontract.

• NIH/NIA R21 "Tetrode biosensor probes for real-time detections of biomarker dysregulation in Alzheimer's disease", submitted 07/07/2021, Dr. Volker Neugebauer, PI Subcontract.

• NIH/NIA R01 "The hippocampal dentate gyrus in aging and Alzheimer's disease: boosting transcription of retinoic acid-sensitive genes through HDAC inhibition and vitamin A supplementation", submitted 07/06/2021, Drs. Josh Lawrence, PI, and Maria Manczak, Co-Investigator.

• NIH/NIA P01 "Hippocampal dentate gyrus in aging and Alzheimer's disease: focus on oxidative stress and mitochondria (Project 3)", submitted 06-01-21, Dr. Josh Lawrence, Subproject PI.

• NIH/NINDS R01 "Amygdala Pain Mechanisms", submitted 04/06/2021, Dr. Volker Neugebauer, PI (Within payline).

• NIH/NIA R01 "Transcriptional Dysfunction in Dentate Gyrus Cell Types: Roles of Retinoic Acid Responsive Genes in Protection Against Alzheimer's Disease Pathogenesis", submitted 03/05/2021, Dr. Josh Lawrence, PI (Within payline).

• NIH/NIA R03 "Alzheimer's disease and chronic pain", submitted 02/15/21, Dr. Maria Manczak, Co-Investigator (Not funded).

• DHHS - Administration for Community Living "Implementing the Virtual Chronic Disease Self-Management Program for Older Adults in Urban and Rural Texas Counties",   submitted 01/29/2021, Dr. Gabriela Ashworth, PI (Not funded).

• NIH/NINDS R01 "A prolactin-mediated neuroendocrine link between stress-induced latent sensitization and female-selective pain", submitted 11/12/21, Dr. Volker Neugebauer, MPI (Funded).

• NIH/NIA R01 "The hippocampal dentate gyrus in aging and Alzheimer's disease: relating antioxidant depletion to cognitive decline", submitted 10/19/21, Drs. Josh Lawrence, PI, and Maria Manczak, Co-Investigator (Not funded).

• NIH/NINDS R01 "The Role of Amygdalar Corticotropin Releasing Factor in the Lasting Effects of Neonatal Pain", submitted 10/16/20, Dr. Volker Neugebauer, PI Subcontract (Not funded).

• Agency for Healthcare Research and Quality – AHRQ, HSS "A COVID19 Challenge: Telemedicine Expansion in Vulnerable Populations", Submitted 05/29/2020, Dr. Gabriela Ashworth (née Arandia), Co-Investigator.

• USDA "Ginger Root Extract for Neuropathic Pain", submitted 03/31/2020, Dr. Volker Neugebauer, MPI (Funded).

• Texas Alzheimer's Research & Care Consortium (TARCC) "The Impact of Biopsychosocial Factors on Mild Cognitive Impairment and MCI-to-ADRD Progression among Urban and Rural Hispanics/Latinos with Data from the Texas Alzheimer's Research & Care Consortium (TARCC) and Project FRONTIER", submitted 03/31/2020, Drs. Gabriela Ashworth (née Arandia), PI, and Volker Neugebauer, MPI (Not funded).

PUBLICATIONS BY GIA MEMBERS

• Mazzitelli, M., Neugebauer V. mGlu3 – New hope for pharmacotherapy of schizophrenia. Biol. Psychiatry 90 356–358, 2021.

• Hein, M., Ji, G., Tidwell, D., D'Souza, P., Kiritoshi, T., Yakhnitsa, V., Navratilova, E., Porreca, F., Neugebauer, V. Kappa opioid receptor activation in the amygdala disinhibits CRF neurons to generate pain-like behaviors. Neuropharmacology 185: 108456 (13 pp.), 2021. PMID: 33444637. PMC7887082.

• Mazzitelli, M., Marshall, K., Pham, A., Ji, G., Neugebauer, V. Optogenetic manipulations of amygdala neurons modulate spinal nociceptive processing and behavior under normal conditions and in an arthritis pain model. Front. Pharmacol. 12: 668337 (18 pp.), 2021. PMID: 34113253. PMC8185300.

• Yi, F., Garrett, T., Deisseroth, K., Haario, H., Stone, E., Lawrence, J.J. Septohippocampal transmission from parvalbumin-positive neurons features rapid recovery from synaptic depression. Sci. Rep. 11: 2117 (20 pp.), 2021. PMID: 33483520. PMCID: PMC7822967.

• Bhatti, J.S., Tamarai, K., Kandimalla, R., Manczak, M., Yin, X., Ramasubramanian, B., Sawant, N., Pradeepkiran, J.A., Vijayan, M., Kumar, S., Reddy, P.H. Protective effects of a mitochondria-targeted small peptide SS31 against hyperglycemia-induced mitochondrial abnormalities in the liver tissues of diabetic mice, Tallyho/JngJ mice. Mitochondrion 58: 49-58, 2021. PMID: 33639273.

• Bhatti, J.S., Thamarai, K., Kandimalla, R., Manczak, M., Yin, X., Kumar, S., Vijayan, M., Reddy, P.H. Mitochondria-Targeted Small Peptide, SS31 Ameliorates Diabetes Induced Mitochondrial Dynamics in Male TallyHO/JngJ Mice. Mol. Neurobiol. 58: 795-808, 2021. PMID: 33025510. PMCID: PMC7856017.

• Pradeepkiran, J.A., Reddy, A.P., Yin, X., Manczak, M., Reddy, P.H. Protective effects of BACE1 inhibitory ligand molecules against amyloid beta-induced synaptic and mitochondrial toxicities in Alzheimer's disease. Hum. Mol. Genet. 29: 49-69, 2020. PMID: 3159529. PMCID: PMC7001603.

• Shen, C-L., Wang, R., Ji, G., Elmassry, M.M., Zabet-Moghaddam, M., Vellers, H., Hamood, A.N., Gong, X., Mirzaei, P., Sang, S., Neugebauer, V. Dietary supplementation of gingerols- and shogaols-enriched ginger root extract attenuate pain-associated behaviors while modulating gut microbiota and metabolites in rats with spinal nerve ligation. J. Nutr. Biochem. *Under Review*

• Avila, M., Thakolwiboon, S., Rice, E.M., Sohn, G., Neugebauer, V., DeToledo, J.C. Gender differences in multiple sclerosis-related pain: A pilot study. Clin. Neurol. Neurosurg. *Under Review*

• Gandhi, P., Gawande, D., Shelkar, G., Gakare, S., Kiritoshi, T., Ji, G., Misra, B., Pavuluri, R., Liu, J., Neugebauer, V., Dravid, S. Dysfunction of glutamate delta-1 receptor-cerebellin 1 trans-synaptic signaling in the central amygdala in chronic pain. Cells (submitted).

RECOGNITION

• "TTUHSC Garrison Institute on Aging Receives Award. Texas Health and Human Services Announces Innovators in Aging Award Recipients". In: TTUHSC Statline Daily Dose, by Suzanna Cisneros, September 3, 2020; https://dailydose.ttuhsc.edu/2020/september/lubbock-garrison-institute-on-aging-recieves-award.aspx.

• Dr. Neugebauer's publication was featured in: Vetter I, Faculty Opinions Recommendation of [Chen Y et al., Sci Transl Med 2020 12(529)]. In Faculty Opinions, 26 Feb 2020; 10.3410/f.737321616.793571434. https://f1000.com/prime/737321616.

• Dr. Neugebauer's publication was featured in: Ji R, Faculty Opinions Recommendation of [Chen Y et al., Sci Transl Med 2020 12(529)]. In Faculty Opinions, 17 Feb 2020; 10.3410/f.737321616.793570804. https://f1000.com/prime/737321616.

• Dr. Neugebauer received the Chancellor's Distinguished Research Award, Texas Tech University System, 2021.

• Dr. Neugebauer received the Douglas M. Stocco Scholarship/Research Award, SOM, TTUHSC, 2020.

MEETINGS ATTENDED AND PRESENTATIONS BY GIA RESEARCHERS

• TTUHSC Student Research Week, March 2020. Students in Dr. Neugebauer's and Dr. Lawrence's laboratories presented their research. Drs. Neugebauer and Lawrence served as judges for scientific poster presentations.

• TTUHSC Center of Excellence for Integrative Health Annual Membership Meeting, September 2020. Dr. Josh Lawrence gave a presentation.

• TARCC 2021 Scientific Symposium – Advances in Alzheimer's Disease Science, Research, and Care, January, 2021. Drs. Neugebauer, Manczak and Lawrence, and Ruben Gonzales, Kandi Quesada, Linda Yin, and Divya Burugu attended virtually.

• Annual Meeting of the Association of Medical School Neuroscience Department Chairs (AMSNDC) "Leading and Succeeding in Uncertain Times", February 2021 (Zoom). Dr. Neugebauer attended.

• IASP Pain Research Forum Seminar, February 2021 (Zoom). Dr. Neugebauer attended.

• TTUHSC Student Research Week, March 2021 (Zoom). Students in Dr. Neugebauer's and Dr. Lawrence's laboratories presented their research. Drs. Neugebauer and Lawrence served as judges for scientific poster presentations.

• GCC Translational Pain Research and Texas Pain Research Consortia "Texas Pain Research Highlights", April 2021 (Zoom). Dr. Neugebauer attended.

• Fifth Annual Research Symposium "Aging-Related Health Issues and Alzheimer's Disease" at TTUHSC, May 2021 (Zoom). Drs. Ashworth and Manczak gave invited lectures.

• 16th Annual NIH Pain Consortium Symposium on Advances in Pain Research "Pain and Pandemics: Challenges and Opportunities in the Current Social and Healthcare Climate", May 2021 (Zoom). Dr. Neugebauer attended the meeting.

• 6th Annual Obesity Research Institute (ORI) Meeting & Competition, May 2021 (Zoom). Drs. Volker Neugebauer and Gabriela Ashworth and Annette Boles gave a presentation about Project FRONTIER.

• The Diversity and Inclusion Group (DIG) for Addressing Health Disparities with Neuroscience: Views by Two seminar series Division of Neuroscience and Behavior (DNB), NIDA, "At the Crossroads of Social Determinants and Biology: Identifying Implications for Future Research", April 2021 (Zoom). Dr. Neugebauer attended.

• Western Association of College and University Business Officers (WACUBO) conference (Zoom), May/2021 (Zoom). Dr. Neugebauer attended.

• Research Society on Alcoholism (RSA) 44th Annual Scientific Meeting, June 2021 (Virtual). A trainee in Dr. Neugebauer's laboratory presented their work.

• The Diversity and Inclusion Group (DIG) for Addressing Health Disparities with Neuroscience: Views by Two seminar series (Zoom). Division of Neuroscience and Behavior (DNB), NIDA, "Social Environment and the Developing Brain", July 2021 (Zoom). Dr. Neugebauer attended.

• IASP Pain Research Forum Seminar, August 2021 (Zoom). Dr. Neugebauer attended.

• National Center for Complementary and Integrative Health (NCCIH) workshop "Methodological Approaches for Whole Person Research", September 2021 (Zoom). Dr. Neugebauer attended.

PROJECT FRONTIER

The GIA serves as an integrative platform for basic research, human studies, and community outreach and education for healthy aging at the TTUHSC (website: www.ttuhsc.edu/centers-institutes/garrisonaging/default.aspx). Both a laboratory- and community-based research study, Project FRONTIER (Facing Rural Obstacles to Healthcare Now Through Intervention, Education & Research) was designed to investigate the prevalence of dementia among rural residents. Due to COVID-19 restrictions, TTUHSC researchers and study coordinators were unable to capture new data during the time of March, 2020 – August, 2021, but several collaborative projects, including a COVID-19 study, were developed by GIA researchers with other TTUHSC faculty, staff and students (see also "COLLABORATIVE RESEARCH PROJECTS ON AGING AND ALZHEIMER'S DISEASE – HUMAN STUDIES").

"Project FRONTIER Participant Assessment of COVID-19" (headed by Gabriela Ashworth, PhD, GIA, SOM, and Volker Neugebauer, MD, PhD, GIA, SOM, GSBS; Research Team: Annette Boles, MS, GIA, Veronica Lopez, GIA, Susan Thompson, GIA and Cordelia Aguirre, GIA) focused on COVID-19 experiences, preventative measures, and available resource services in rural West Texas communities in comparison with Lubbock County residents. Urban-rural comparison revealed disparities in COVID-19 experiences (testing, cases, fatalities) amongst the communities, which call for strategies aimed at improving healthcare access in rural areas through telemedicine and other innovative approaches.

"Biopsychosocial predictors of cognitive stability, decline, and resilience in a sample of older, rural-dwelling West Texans: A retrospective cohort study using data from Project FRONTIER" (headed by Gabriela Ashworth, PhD, GIA, SOM; Co-Investigators: Duke Appiah, PhD, GSBS, and Annette Boles, MS, GIA) explored biopsychosocial risk factors on cognitive stability, cognitive resilience, and cognitive decline.

"Mind your heart: the association of heart/vascular aging with mild cognitive impairment using data from Project FRONTIER" (headed by Duke Appiah, PhD, GSBS, and Gabriela Ashworth, PhD, GIA, SOM; Co-Investigators: Nandini Nair, MD, PhD, SOM, and Annette Boles, MS, GIA) investigates the association of predicted heart/vascular age (PHA) with MCI, the role of ethnicity in changes in cognition due to PHA, and the influence of sociodemographic and lifestyle-related factors on excess PHA, and seeks to develop a statistical algorithm to predict

MCI considering PHA, biomarkers and other factors pertinent to rural communities.

"Depression, Vitamin D, and Health Disparities among Hispanics in Older Rural West Texans: A Project FRONTIER Study" (headed by J. Josh Lawrence, PhD, GIA, SOM, GSBS; Research Team: Mohammed Pourghaed, BS, SOM, Ashish Sarangi, MD, SOM, Felipe Ramirez Velandia, MD, Jonathan Kopel, MD, PhD, SOM, GSBS, John Culberson, MD, SOM, Gabriela Ashworth, PhD, GIA, SOM, Hafiz Khan, PhD, GSBS, Annette Boles, MS, GIA, and Volker Neugebauer, MD, PhD, GIA, SOM, GSBS) explored relationships between serum vitamin D (VD) levels and Geriatric Depression Scale (GDS), a subjective measure of depression. VD levels were negatively correlated with GDS total scores, were higher in clinically depressed with reported use of antidepressant medications, and were lower in Hispanic/Latinos (HLs) compared to non-HLs, suggesting disparities in VD-related health status and depression among HL and non-HL populations.

"Associations between VD Levels with Hispanic Ethnicity, General Health Status, and Co-Morbid Conditions among Older Rural West Texans: A Project FRONTIER Study" (headed by J. Josh Lawrence, PhD, GIA, SOM, GSBS; Research Team: Mohammed Pourghaed, BS, SOM, Ashish Sarangi, MD, SOM, Felipe Ramirez Velandia, MD, Jonathan Kopel, MD,PhD, SOM, GSBS, John Culberson, MD, SOM, Gabriela Ashworth, PhD, GIA, SOM, Hafiz Khan, PhD, GSBS, Annette Boles, MS, GIA, and Volker Neugebauer, MD, PhD, GIA, SOM, GSBS) investigated relationships between measures of general health, history of disease, vitamin supplementation, and disease-related blood-based biomarkers. Obesity, diabetes, depression, and nicotine use were significantly negatively associated with VD level. The most significant parameters to predict VD level were Hispanic ethnicity and VD supplementation. VD levels were positively associated with VD supplementation. Sufficient VD levels achievable through VD supplementation may improve general health, reduce the severity of co-morbid conditions, and improve overall quality of life.

GIA BRAIN BANK

The GIA Brain Bank (GBB) was established in 2007 to aid families interested in arranging a brain autopsy on individuals to confirm clinical diagnosis of dementia and to provide tissue for current and future research in dementia related diseases. During the challenging time of COVID-19, the GBB continued to serve the families of enrolled patients while continuing improving our banking procedures and protocols. The GBB maintained the service of providing autopsy results for the diagnosis of the patient and interpreting these findings to family members on occasion.

During this past year, we reached out to other brain banks to seek collaborative opportunities and to inquire about their procedures and protocols to enhance and align our methods as needed. Some of the brain banks we reached out to were the University of Kentucky, UT Southwestern and UT San Antonio. These inquiries resulted in establishing a direct line of communication with one another, exploring ways to assist each other with cases in the areas these universities cover, discussing the challenges faced in enrollment and harvesting tissue, and comparing harvesting and banking protocols which led to the GBB purchasing additional lab supplies and an invitation from the Biggs Institute Brain Bank Core at UT San Antonio to participate in the neuropathology clinicopathologic consensus meetings on research subjects as part of the Texas Alzheimer's Research and Care Consortium (TARCC). This collaborative initiative of TARCC provides valuable opportunities for GBB to participate in collaborative research projects. A budding partnership is developing between the GBB and the TTUHSC Institute of Anatomical Sciences to seek collaborative opportunities between the Institutes and our Executive Director, Dr. Volker Neugebauer will be serving on the Anatomical Research Committee (ARC).

Quality assessment of postmortem human brain tissues from 174 donors was done by RNA Integrity Number (RIN) analysis. GBB brains were from healthy individuals and from patients with neurodegenerative disorders. Both the surface and inner tissues from the brains were analyzed for every subject. Overall, 90 out of 174 samples had RIN of 4 or greater for at least one tissue sample indicating they are suitable for different molecular biology studies, whereas 84 brain samples had a RIN of less than 4. This suggests that more than 50% of the brains from GBB could be potentially used for research and 38% of these GBB brains with high confidence.

We look forward to resuming educational activities such as Red Bag Tours for High School Students and other educational sessions for the community.
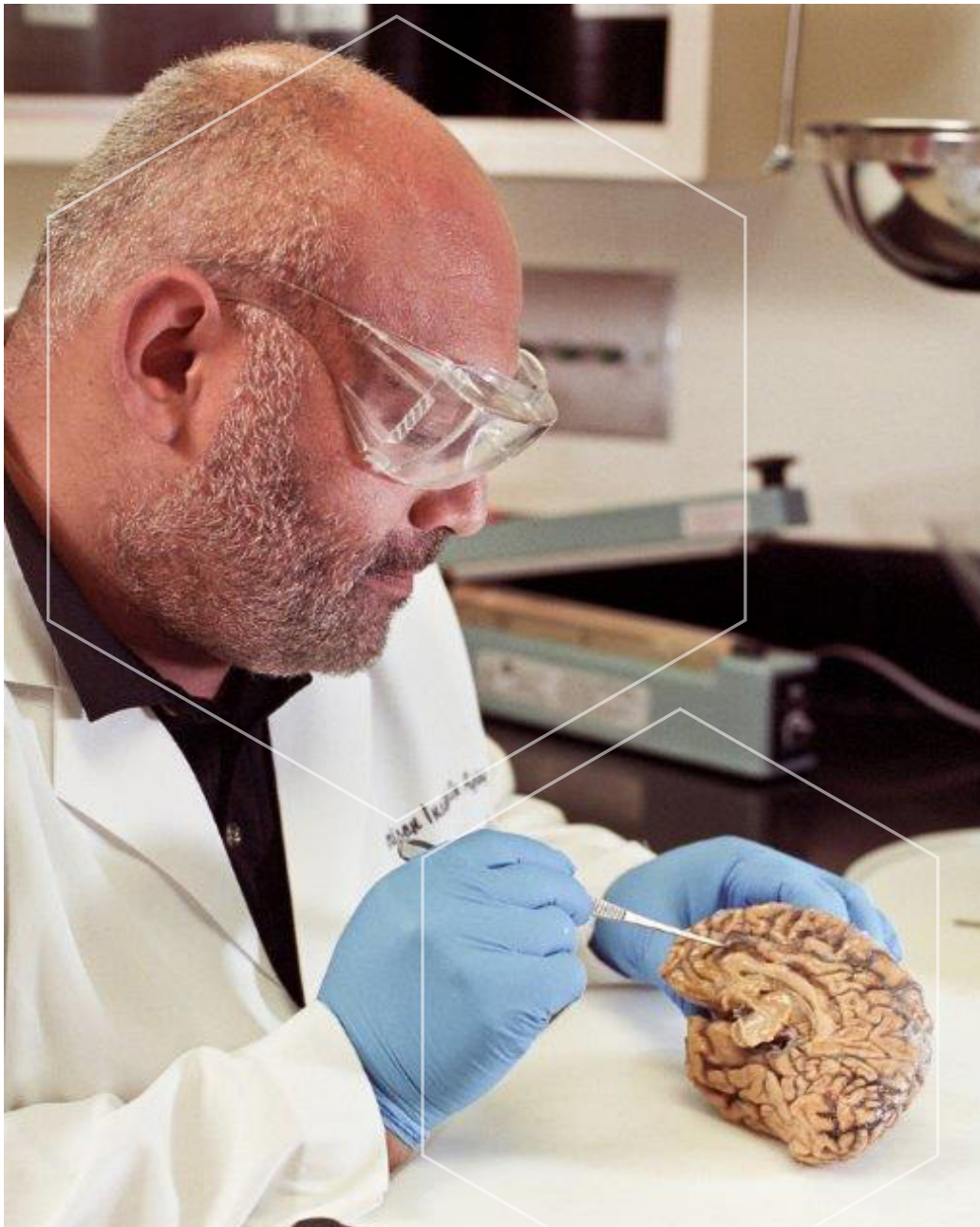
EDUCATION
RESEARCH PRESENTATIONS, EDUCATIONAL PROGRAMS, LECTURE SERIES

TRANSLATIONAL NEUROSCIENCE AND PHARMACOLOGY LECTURE SERIES

09.22.2020 *Minocycline protects developing brain against ethanol-induced damage* | Graduate Student, Josh Willms | Texas Tech University Health Sciences Center

09.24.2020 *The C-Circle Assay for alternative lengthening of telomeres activity* | Graduate Student, Trevor Burrow | Texas Tech University Health Sciences Center

10.06.2020 *Sex Differences in Cannabinoid Analgesia* | Graduate Student, Henry Blanton | Texas Tech University Health Sciences Center

10.20.2020 *Defects in Protein Biogenesis and Human Diseases* | Distinguished Guest Speaker, Andrey Karamyshev, PhD | Texas Tech University Health Sciences Center

10.30.2020 *Nicotine and electronic cigarette (E-Cig) exposure decreases brain glucose utilization in ischemic stroke* | Distinguished Guest Speaker, Core IV Seminar Series, Dr. Thomas Abbruscato | Texas Tech University Health Sciences Center

11.03.2020 *Molecular Basis for inhibition of the Na+/Citrate Transporter NaCT (SLC13A5) by Bicarboxylate Inhibitors* | Graduate Student, Valeria Jaramillo-Martinez | Texas Tech University Health Sciences Center

11.09.2020 *The Prion Principle at the Root of Neurodegenerative Diseases: Implications for Treatment and Diagnosis* | Distinguished Guest Speaker, National Alzheimer's Disease Awareness Month, Claudio Soto, PhD | University of Texas Health Sciences Center

11.10.2020 *Targeting DNA Damage Response Promotes Antitumor Immunity through STING Mediated T-cell Activation in Small Cell Lung Cancer* | Graduate Student, Ismail Mohiuddin | Texas Tech University Health Sciences Center

11.17.2020 *Role of MCP – 1 and CCR2 in ethanol-induced neuroinflammation and neurodegeneration in the developing brain* | Graduate Student, Xiaobo Liu | Texas Tech University Health Sciences Center

12.01.2020 *Neuron-microglia interactions in the brain in the neuropathic pain model* | Graduate Student, Peyton Preston | Texas Tech University Health Sciences Center

12.08.2020 *Optogenetic manipulation of amygdala CRF neurons in pain* | Graduate Student, Mariacristina Mazzitelli | Texas Tech University Health Sciences Center

01.19.2021 *Mitochondrial calcium signaling on Alzheimer's Disease* | Distinguished Guest Speaker, Pooja Jadiya, PhD | Temple University, Lewis Kate School of Medicine

01.26.2021 *Innate immune responses to alpha-synuclein facilitate its progressive aggregation* | Distinguished Guest Speaker, Nikhil Panicker | John Hopkins University School of Medicine

02.02.2021 *RNA Metabolism and Translational Regulation in Neurodegenerative Diseases* | Distinguished Guest Speaker, Haining Zhu, PhD | University of Kentucky College of Medicine

03.02.2021 *The impact of anxiety on Alzheimer's disease progression: of mice and (Wo) men* | Distinguished Guest Speaker, Holly Hunsberger, PhD | Columbia University

03.03.2021 *Boron based Probes and Pharmacological Agents for Brain Diseases* | Distinguished Guest Speaker, Bhaskar Das, PhD | Arnold and Marie Schwartz College of Pharmacy and Health Sciences, Long Island University Brooklyn, New York

03.08.2021 *Biomarker tools for Alzheimer's Disease using high throughout data* | Distinguished Guest Speaker, Laura Ibanez, PhD | Washington University School of Medicine, St. Louis, Missouri

03.16.2021 *Structural insights and classification of the disease-causing mutations in human Na+ coupled citrate transporter (NaCT)* | Graduate Student, Valeria Jaramillo-Martinez | Texas Tech University Health Sciences Center

04.06.2021 *The Telmeric DNA C-circle Assay as a Companion Diagnostic for the p53 activating drug APR-246* | Medical and Graduate Student Trevor Burrow | Texas Tech University Health Sciences Center

04.27.2021 *Development of a porcine model of a DSM-5 relevant Alcohol Use Disorder* | Graduate Student, Xiaobo Liu | Texas Tech University Health Sciences Center

05.04.2021 *Pharmacological and optogenetic manipulation of amygdala in pain* | Graduate Student, Mariacristina Mazzitelli | Texas Tech University Health Sciences Center

05.11.2021 *Treatment of Inflammatory Disorders with Modified Minocycline Analogs: Rheumatoid Arthritis* | Medical and Graduate Student, Josh Willms | Texas Tech University Health Sciences Center

ANNUAL RESEARCH SYMPOSIUM

The Fifth Annual Research Symposium "Aging-Related Health Issues and Alzheimer's Disease" was a collaboration of Center of Excellence for Translation Neuroscience and Therapeutics (CTNT) and the Garrison Institute on Aging.

Virtual Event: Wednesday, May 5, 2021

Distinguished Keynote Speaker and ADK Lecturer:
Eliezer Masliah, MD | Director, Division of Neuroscience | National Institute of Aging, NIH

Opening Remarks
Min Kang, PharmD | Interim Senior Vice President for Research | Texas Tech University Health Sciences Center
Volker Neugebauer, MD, PhD | Director, CTNT, Professor and Chair, Pharmacology and Neuroscience, Executive Director and Chief Scientific Officer, GIA | Texas Tech University Health Sciences Center

Thomas Tenner, PhD | Professor, Department of Medical Education | Texas Tech University Health Sciences Center

CTNT Collaborative Research Presentations and Presenters:

Dysfunctional Mitochondria and Mitophagy in Tau pathology of Alzheimer's disease
Maria Manczak, PhD | Research Assistant Professor, Department of Neurology and Garrison Institute on Aging | Texas Tech University Health Sciences Center

Biopyschosocial Predictors of Mild Cognitive Impairment, the Precursor of Alzheimer's Disease and Other Dementias: A Project FRONTIER Study
Gabriela Ashworth, PhD | Research Assistant Professor, Pharmacology and Neuroscience and Garrison Institute on Aging, Co-Director, Project Frontier | Texas Tech University Health Sciences Center

Deciphering Molecular Mechanisms of Neurodegenerative Diseases
Andrey L. Karmyshev, PhD | Assistant Professor, Cell Biology and Biochemistry | Texas Tech University Health Sciences Center

Round Table Attendees
<u>CTNT Director and Steering Committee</u>
Volker Neugebauer, MD, Vadivel Ganapathy, PhD, Susan Bergeson, PhD, Josee Guindon, DVM, PhD, Chwan-Li (Leslie) Shen, PhD, George Henderson, PhD

<u>GIA Research Collaborators</u>
Divya Burugu, MS, Gail Cornwall, PhD, Andrey Karamyshev, PhD, J. Josh Lawrence, PhD, Maria Manczak, PhD, Igor Ponomarev, PhD, Kevin Pruitt, PhD, Xiangling (Linda) Yin, MS

<u>GIA Community/Clinical Collaborators</u>
Gabriela Ashworth, PhD, Annette Boles, MS, Duke Appiah, PhD, John W. Culberson, MD, Parunyou Julayanont, MD, Theresa Byrd, PhD

<u>Institutional</u>
Darrin D'Agostino, DO, MPH, MBA, Min H. Kang, PhD, Tom Tenner, PhD

Posters Presentations

Basic Science – Graduate/Undergraduate

Henry Blanton, Sarah Hernandez, Brent Kisby, Sadisna Shahi, Mariacristina Mazzitelli

Basic Science – Medical Student

Karen Casteneda, John Albin, Nandini Ray, Shyam Sheladia

Basic Science – Postgraduate

Isabel Castro-Piedra

Clinical – Graduate/Undergraduate

Jackson Driskill, Siayash Shahbazi

Clinical – Medical Student

Abraham Jonathan, Asher George, Katherine Holder, Daniel Payberah, Omhammed Pourghead, Seth Swinney

Clinical – Postgraduate

Ashish Sarangi

2021 Poster Award Winners

Basic Science

• **Graduate Student: Sarah Hernandez** – "Regulation of alpha-Synuclein Biogenesis Through the RAPP Pathway"

• **Medical Student: Nandini Ray** – "Structural and Physiological Changes of the Aging Kidney: A Focus on COVID-19"

• **Post Graduate/Trainee: Isabel Castro-Piedras** – "Role of aberrant Wnt/Ca2+ signaling in Alzheimer's disease and cancer"

Clinical

• **Graduate Student: Siayash Shahbaz** – "Design and synthesis of novel KOP receptor antagonists, a treatment option for neuropathic pain"

- **Medical Student: Asher George** – "Incidental Neuroendocrine Tumor in Ileal Conduit Following Ileal Bladder Augmentation"

- **Post Graduate/Trainee: Ashish Sarangi** – "Associations between Vitamin D Levels, Depression, and Hispanic/Latino Ethnicity among Older Rural West Texans: A Project FRONTIER Study"

MEETINGS ATTENDED BY GIA COMMUNITY OUTREACH AND EDUCATION STAFF

- Apoyando la Salud Mental durante COVID-19 | Virtual | September 22, 2020 | Ms. Lopez

- Texas Cardiovascular Disease and Stroke Partnership Meeting | Virtual | November 13, 2020 | Ms. Boles and Lopez

- 2021 TARCC Scientific Symposium | Virtual | January 2021 | Ms. Boles and Lopez

- South Plains Hunger Solutions Meeting | Virtual | February 12, 2021 | Ms. Boles and Lopez

- Texas Association of Promotoras & Community Health Workers: Engage for Health | Virtual | February 19, 2021 | Ms. Lopez

- For Your Heart – Learn and Live Conference | Virtual | February 26, 2021 | Ms. Lopez

- Dementia Care in the Context of COVID-19 The Impact for Families | University of Texas Health Sciences Center at San Antonio | Virtual | March 16, 2021 | Ms. Boles, Lopez, Thompson and Blackmon

- West Texas Area Health Education Center (in collaboration with Texas Tech University Health Sciences Center El Paso) - Mental Health and Substance Use in the Time of COVID-19: A Border Perspective | April 8, 2021 | Ms. Boles and Lopez

- Obesity Research Institute Meeting | Virtual | May 12, 2021 | Drs. Neugebauer and Ashworth, Ms. Boles presented information about Project FRONTIER.

- Texas State Plan for Alzheimer's Disease | Virtual | June 2, 2021 | Ms. Boles and Lopez

- AmeriCorps Senior Virtual Convening 2021 | June 16, 23 & 30, 2021 | Ms. Lopez and Thompson

- 7th Annual Caregiver Conference 2021 | Science Spectrum Exhibit Hall | July 22, 2021 | Ms. Lopez and Thompson

- Hillcrest Open House and Caregiver Program | June 29, 2021 | Ms. Blackmon

- AmeriCorp Retired and Senior Volunteer Directors' Meeting of Texas | Virtual | August 9, 2021 | Ms. Lopez and Thompson

- Southwest Parkinson Society Symposium | Science Spectrum | August 13, 2021 | Ms. Blackmon

- Opioid Misuse Prevention in Older Adults Virtual Symposium | August 19, 2021 | Ms. Boles, Lopez and Thompson

DIABETES SELF-MANAGEMENT PROGRAM

Due to COVID restrictions, the GIA diabetes-self management coordinators were unable to conduct the program. A new program will begin in 2022.

HEALTHY AGING LECTURE SERIES

The Healthy Aging Lectures Series is a monthly educational program for the public to learn more about innovative research and health topics of interest to seniors. During the 2021 academic calendar, the following lectures were hosted virtually.

09.2020 *Muscle Strength and Aging* | Ty Palmer, PhD | TTU Kinesiology

10.2020 Prevention of Hypertension and Age-related Loss of Muscle Strength and Mass | Arturo Figueroa, MD, PhD | TTU Kinesiology and Sport Management

11.2020 *Brain Health During the COVID Pandemic* | John Culberson, MD | TTUHSC Associate Professor of Family and Community Medicine; Bernhard T. Mittemeyer, MD, Endowed Chair in Geriatric Medicine; Program Director, Geriatric Fellowship

01.2021 *Starting Small: Starting the New Year Off Right* | Hollie Booe, MS, RDN, LD | TTU Nutritional Sciences

02.2021 *Secondary Trauma and Burnout in the Age of COVID-19* | Michael Gomez, PhD | TTUHSC Pediatric Licensed Psychologist

03.2021 *Supplement and Vitamins* | Shannon Galyean, PhD, RDN, LD| TTU Nutritional Sciences

04.2021 *Senior Fitness* | Ty Palmer, PhD| TTU Kinesiology and Sport Management

05.2021 *Getting and Staying Fit and Well* | Angela Lumpkin, PhD | TTU Kinesiology and Sport Management

COMMUNITY OUTREACH

NEW COMMUNITY-BASED INITIATIVES

The GIA team is committed to creating the Dementia Friendly Lubbock program, which is designed to raise awareness of dementia and develop respect and inclusion for people with dementia, provide services and resources embedded in all areas of community to promote quality of life, and to support and educate people with dementia, their caregivers and families, from diagnosis through disease progression. Program implementation and future collaborations were halted in March due to the COVID-19 pandemic. The team has gathered information from various agencies and organized an Action Team. The Action Team includes:

- Joan Blackmon, Coordinator, TTUHSC Garrison Institute on Aging
- Susan Thompson, Coordinator, TTUHSC Garrison Institute on Aging
- Lisa Gonzales, Director of Caregiver Programs, South Plains Association of Governments
- Allison McMillan, Sales Manager Memory Care, Brookdale Senior Living Center
- Connie Durham, Caregiver

The Team has contacted key leaders and are creating an assessment to determine specific needs of Lubbock businesses, community agencies and other organizations to implement Dementia Friendly, Lubbock. The data will then be compiled and interpreted to identify priorities. Once the priorities are set and the COVID restrictions for HSC have been lifted, the priorities will be shared with the community.

CARE PARTNER ACADEMY

The Care Partner Academy is led by Ms. Joan Blackmon. Ms. Blackmon has extensive experience working with caregivers. She works closely with local agencies and connects community members with resources that are available within the community. She also collaborates with Dr. John Culberson to determine educational session topics. Dr. Culberson is an Associate Professor of Family and Community Medicine, Bernhard T.

Mittemeyer, M.D. Endowed Chair in Geriatric Medicine, and Program Director, Geriatric Fellowship. Topics range from community service opportunities to stress management techniques, problem solving and coping strategies. These educational sessions were conducted via the Zoom platform and included the following presenters and topics:

09.09.2020 *Being Prepared in Your Community* | Clinton Thetford | Lubbock County, Emergency Management Coordinator, LEPC Chairperson

09.23.2020 *Planning for Emergencies* | Clinton Thetford | Lubbock County, Emergency Management Coordinator, LPEC Chairperson

10.07.2020 *Identifying Financial Abuse in Elders* | Caitlin Corey, JD | Legal Aid of Northwest Texas, Senior Justice Program

11.10.2020 *"When is it time to look at a residential facility?"* | Allison McMillan, BS | Sales Manager, Brookdale Monterrey Memory Care

12.08.2020 *Surviving the Holidays* | John W. Culberson, MD | TTUHSC Associate Professor of Family and Community Medicine; Bernhard T. Mittemeyer, MD Endowed Chair in Geriatric Medicine; Program Director, Geriatric Fellowship | Joan Blackmon, MBA | GIA

01.13.2021 *Bouncing Back from the Holidays: Where to get the Vaccine?* | John W. Culberson, MD | TTUHSC Associate Professor of Family and Community Medicine; Bernhard T. Mittemeyer, MD Endowed Chair in Geriatric Medicine; Program Director, Geriatric Fellowship | Joan Blackmon, MBA | GIA

02.02.2021 *Where to go and what to look for?* | Becky Haskitt, LCSW | Caregiver for Spouse

02.19.2021 *Alzheimer's disease update* | John W. Culberson, MD | TTUHSC Associate Professor of Family and Community Medicine; Bernhard T. Mittemeyer, MD Endowed Chair in Geriatric Medicine; Program Director, Geriatric Fellowship

03.02.2021 *How to make tough decisions and the Stages of Grief* | Becky Haskitt, LCSW | Caregiver for Spouse

03.16.2021 *22 questions to ask before moving*| Becky Haskitt, LCSW | Caregiver for Spouse

04.13.2021 *Moving out of quarantine*| John W. Culberson, MD | TTUHSC Associate Professor of Family and Community Medicine; Bernhard T. Mittemeyer, MD Endowed Chair in Geriatric Medicine; Program Director, Geriatric Fellowship | Joan Blackmon, MBA | GIA

7th Annual Caregiver Conference

The South Plains Association of Governments (SPAG) Area Agency on Aging, in collaboration with the GIA, TTUHSC School of Medicine, Newby Family, and Raider Ranch, hosted the 2021 Caregiver Conference on July 22nd. The conference was held at the Science Spectrum Exhibit Hall in Lubbock, Texas. The guest speaker was Tam Cummings, PhD, a gerontologist dedicated to untangling the complexities of dementia. An internationally recognized author, educator and keynote speaker, Dr. Cummings has helped thousands of families and professional care partners throughout the world to understand the stages of dementia and the process of disease.

2020 NATIONAL ALZHEIMER'S DISEASE AWARENESS MONTH

In 1983, U.S. President Ronald Reagan declared November as National Alzheimer's Disease Awareness Month to foster awareness and inspire action against Alzheimer's disease, the most common cause of dementia among older adults. According to the Alzheimer's Association 2019 Alzheimer's Disease Facts and Figures report, an estimated 5.8 million Americans are living with Alzheimer's disease; and by 2050, this number is projected to rise to nearly 14 million Americans. Alzheimer's disease is the sixth leading cause of death in the U.S., and the fifth leading cause of death among individuals aged 65 and older. In November 2020, the GIA commemorated National Alzheimer's Disease Awareness Month by raising awareness and educating the public on Alzheimer's disease. Due to COVID-19 restrictions, the GIA conducted all education awareness events via the Zoom platform.

11.04.20 Retired Senior Volunteer Recognition Event

11.09.20 Care Partner Academy Forum: Panel of the Stigma of Alzheimer's Disease (Virtual Event)

11.10.20 Translational Neuroscience Series, organized jointly by the Garrison Institute on Aging, the Department of Pharmacology and Neuroscience, School of Medicine and the Center of Excellence for Translational Neuroscience and Therapeutics Virtual Webinar featuring Claudio Soto Jara, PhD

11.18.20 Healthy Aging Lecture Series featuring John Culberson MD

LUBBOCK RETIRED AND SENIOR VOLUNTEER PROGRAM (RSVP)

The Lubbock RSVP is grant funded and serves the purpose of encouraging adults, who are 55 and older, to volunteer and assist the Lubbock community by using the abilities, interests and skills they have acquired throughout their life to meet the needs of the community. This program engages seniors in a wide array of community services that help non-profit and community-based organizations including health, nutrition, human services, education, community and economic development and public safety.

- Total Volunteers as of September 1, 2021: 468
- New Volunteers since September 1, 2020: 62
- Approximate # of community served hours since September 1, 2020: 105,579
- Obtained augmentation award for Retired and Senior Volunteer Program (Lopez, Boles)
- Annual Recognition Event held on March 23, 2021 had 110 volunteers drive up to receive their meal, t-shirt and extra goodies!
- To address the shortage of face coverings during the early months of the COVID-19 pandemic, RSVP volunteers sewed face coverings for health care workers and community members.
- Items made by volunteers since September 1, 2020-Aug. 31, 2021:
    - o 300 Lap quilts
    - o 500 Toboggans and beanies
    - o 200 Face coverings
    - o Stockings for servicemen: 3,000
    - o Bears for Children's Connection, Children's Cancer and Texas Boys Ranch: 500
    - o Adult bibs: 300
    - o Walker pockets: 120

Retired and Senior Volunteer Program Council Members

The RSVP Advisory Council is a group of individuals representing the interests of our volunteers, volunteer stations, and the community at large. Advisory Council members advise, assist, and advocate for effective project operations of RSVP of Lubbock County. They support constructive changes within the program, generate new ideas, and serve as ambassadors to the wider Lubbock community.

Primarily Advisory Council members are committed to the following three goals:

- Promote RSVP to potential members in order to help the program meet its volunteer recruitment targets.
- Assist with planning and executing one or more successful Recognition events each year to celebrate the contributions of RSVP volunteers.
- Capture the remarkable stories of RSVP volunteers in order to communicate these to the local and national service communities.

The 2020 – 2021 Council includes the following leaders:

- Michael Boyd, Veterans Affairs
- Liz Castro, South Plains Associations of Governments
- Ayda Chapa, South Plains Associations of Governments
- Chris Gallaneau, Texas Home Health
- Lesli Griffin, Calvert Home Health
- Stacie Perez, HHSC Foster Grandparents
- Joseph Pullen, Carillon
- Carson Scott, TTUHSC, Senior Clinical Department Administration

Presidential Lifetime Achievement Awardees

Each year, Lubbock RSVP recognizes volunteers that have contributed more than 4,000 hours of volunteer service to our community. They were presented an award and received a certificate from Senator Ted Cruz as well. The 2021 Presidential Lifetime Achievement Award was presented to:

Dona Naussbaum works on the Stockings for Servicemen Project. This project was started in 2007 and has mailed out over 48,000 stuffed stockings to our military overseas each year during Christmas time.

Tony Kite volunteer for the Friends of the Library (FOL). The Mahon Library has a basement full of books that are donated by the public. The volunteers go through the donated books and shelf them for sale to the general public at a reduced price. The revenue from the book sale funds programs for the library that help teach children and adults to read.


Lillian Azahgarhi volunteer for the Friends of the Library (FOL). The Mahon Library has a basement full of books that are donated by the public. The volunteers go through the donated books and shelf them for sale to the general public at a reduced price. The revenue from the book sale funds programs within the library that help teach children and adults to read.

Tommy Largent volunteer for the Friends of the Library (FOL). The Mahon Library has a basement full of books that are donated by the public. The volunteers go through the donated books and shelf them for sale to the general public at a reduced price. The revenue from the book sale funds programs for the library that help teach children and adults to read.

AWARDS

Dr. Neugebauer received the Chancellor's Distinguished Research Award, Texas Tech University System, 2021.
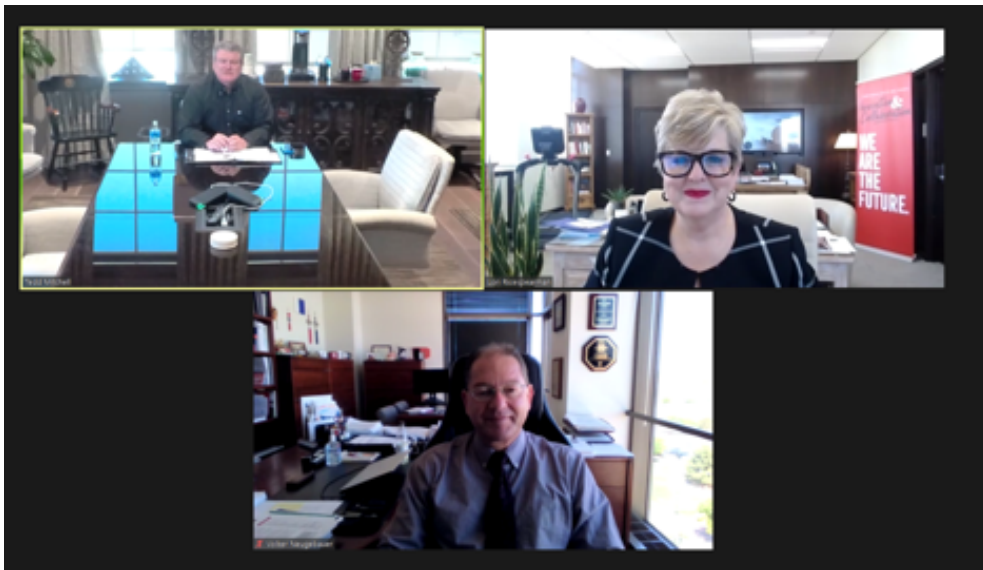

Dr. Neugebauer received the Douglas M. Stocco Scholarship/Research Award, SOM, TTUHSC, 2020.

FINANCIALS

The Garrison Institute on Aging (GIA) is funded by a combination of competitive grants, institutional funding, and endowment earnings. Previously, NIH funded grant awards formed the bulk of grant funding received by the GIA. With the re-organization of the GIA team due to leadership and staff changes and the COVID-19 pandemic, number of funded grants has decreased. The GIA is committed to work to increase external grant funding with an increase in grant applications, collaborative projects, and the search for a funded faculty member who would further enhance/establish GIA-based research on aging and Alzheimer's Disease and engage in collaborations across TTUHSC. A collaborative grant was obtained recently and an NIH grant application received a score within funding range. Through an endowment provided by the Garrison family, the GIA receives a secure flow of income from the earnings on the endowment. These earnings have decreased, much like the grant funding, due to economic factors and the COVID-19 pandemic. While greatly appreciated, the earnings alone are not enough to operate the GIA without the support of the Texas Tech University Health Sciences Center administration. It goes without saying that the funds received from our generous donors, particularly the Garrison Family, are greatly appreciated and allow the GIA to operate a variety of research, community outreach and educational programs and the GIA Brain Bank.

In keeping with the GIA vision, Dr. Neugebauer and his research team are working to unlock the mysteries surrounding Alzheimer's and other neurological disorders. Investments in the Brain Bank and research equipment have been made. As the new fiscal year for TTUHSC begins the GIA is actively pursuing several grant applications and collaborative and competitive grant awards.

31%

29%

2%

38%

- 🟥 Grant funding
- ⬜ Private Donations
- ⬛ Institutional Funding
- 🔲 Endowment Earnings
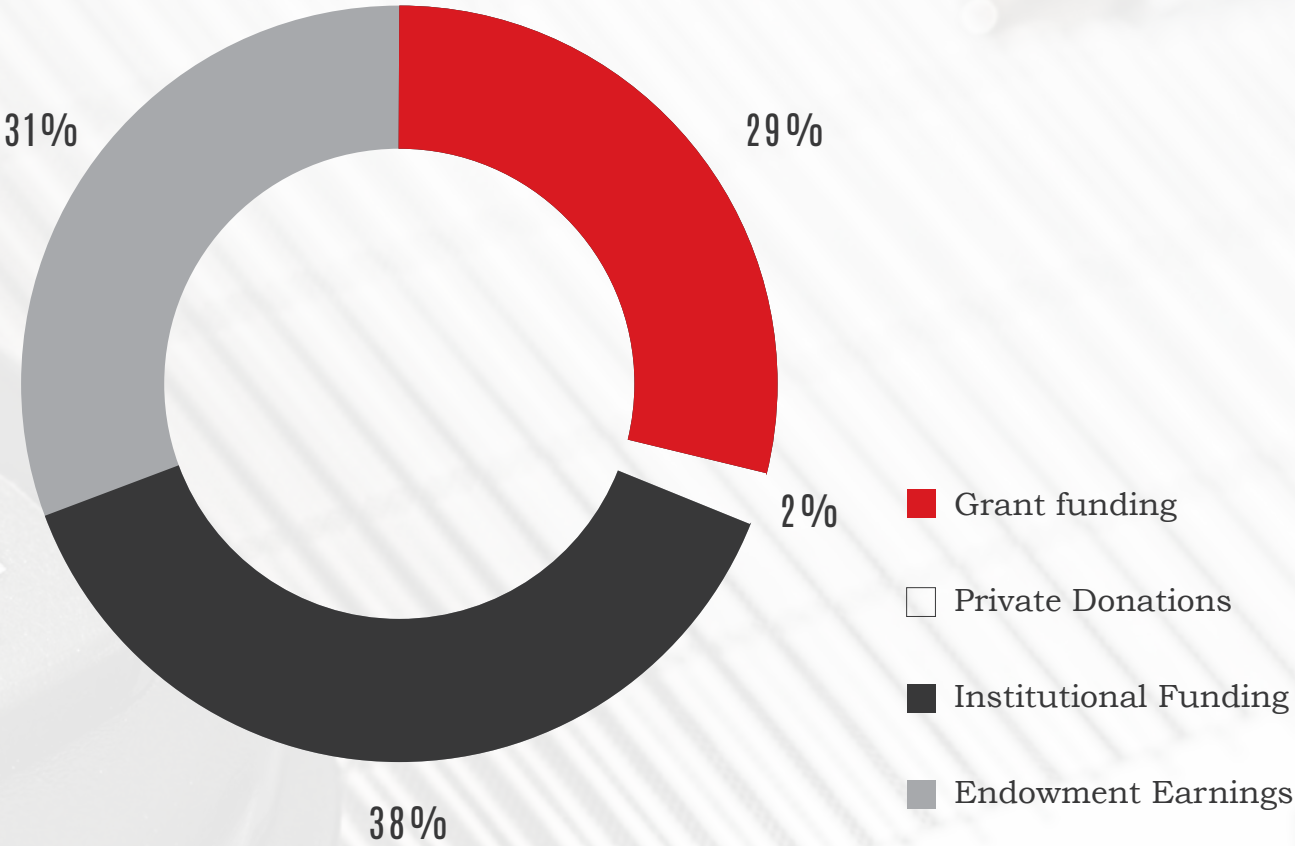
FUTURE GOALS AND PLANS

The GIA seeks to play a critical role in the new vision at Texas Tech University Health Sciences Center (TTUHSC) to transform health care through innovation and collaboration. The GIA strives to serve as a hub for collaborative translational research, education, and community outreach activities in the areas of healthy aging and aging-related health issues, including dementias such as Alzheimer's disease.

Several preclinical and clinical research projects have been established by the GIA team that are funded or are expected to be funded by NIH. Collaborative research projects through the GIA's Collaborative Seed Grant Program in Aging are aimed at generating external funding through grant applications. Results from projects headed by Dr. Appiah and Dr. Ashworth have been communicated at regional and national conferences and manuscripts are in preparation.

The GIA Brain Bank (GBB) continues to be enhanced through various collaborative efforts, both locally and nationally. Quality assessment that was conducted suggests that more than 50% of the human brains from GBB could be potentially used for research and 38% of these GBB brains with high confidence. This will boost research opportunities at the GIA. Some GBB tissues have already been utilized for GIA research projects. Interactions about tissue sharing have begun with the Biggs Institute Brain Bank Core at UT San Antonio as part of a collaborative initiative of the Texas Alzheimer's Research and Care Consortium (TARCC) and with the TTUHSC Institute of Anatomical Sciences. These should generate collaborative opportunities in research and education.

While participation of subjects in rural communities in Project FRONTIER was impossible due to COVID-19 restrictions, subjects from Project FRONTIER and Lubbock County were asked to participate in a COVID-19 phone survey led by Dr.'s Neugebauer and Ashworth. The assessment's objective was to gain knowledge about the impact of COVID-19 on urban and rural dwelling older adults in the South Plains Texas region. The initial survey's objectives included: testing, diagnosis, symptoms, preventive measures and health care

resources and services. The second phase of the project will employ longitudinal monitoring of COVID-19 as well as short- and long-term effects of the COVID-19 vaccine among participants re-contacted. As soon as circumstances allow, we will resume data collection for Project FRONTIER and seek collaborations across TTUHSC and TTU.

Additionally, GIA community outreach programs work within the COVID-19 restrictions to continue promoting educational programs that are being delivered virtually. The Care Partner Program and Dementia-Friendly Lubbock Initiative are vital community-based projects. The GIA staff is collaborating with the TTU Psychology department to enhance the Care Partner Academy by incorporating a mental health service for caregivers. These services will be offered in a face-to-face setting or virtually if caregivers prefer. Dementia-Friendly Lubbock, will raise awareness around AD through the direction of the Action Team. The Action Team has identified four local businesses that will be receiving training on how employees should interact with individuals facing AD. Our programs are aimed at educating and raising awareness around Alzheimer's disease in the community.

Finally, our overarching goal is focused on a West Texas Dementia and Memory Care Hub, which would serve as a central dementia hub for community members from West Texas, the South Plains, and neighboring states. Given the growing older adult population in Lubbock and surrounding communities, a "one-stop-shop" center focused on dementia care is much needed. To fulfill this gap, this project aims to offer an innovative and interdisciplinary care model to the West Texas area.

The GIA is fully committed to its mission of promoting healthy aging through innovation and collaboration. We will continue to explore collaborative opportunities across TTUHSC and TTU in translational research, curricular activities and advanced educational programs for our community.

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Garrison Institute on Aging