

Welcome to the 2023/2024 HSC College of Pharmacy Poster Forum

IREB 2nd floor

Coming together to celebrate our HSC College of Pharmacy

Activities Include:

4:00 pm – 4:45 pm	Digital Poster Presentations Mix & Mingle
4:45 pm – 5:00 pm	Faculty Keynote Presentation
5:00 pm – 6:00 pm	Awards Ceremony and Formal Poster Presentations by 1st Place Winners

Poster Presentations

4:00 pm – 4:45 pm

IREB-250	Clinical Practice (CP-001 through CP-004)
IREB-250	Research – Pharmaceutical & Basic Sciences (RPBS-001 through RPBS-010)
IREB-260	Research – Public Health/Health Services/Outcomes (RPH-001 through RPH-006)
IREB-260	Service (S-001 through S-002)
IREB -260	Teaching & Education (TE-001 through TE-006)

Faculty Keynote Speaker: Kyle A. Emmitte, PhD



Dr. Emmitte received a BS in chemistry from Texas A&M University and a PhD in Organic Chemistry from the University of North Carolina at Chapel Hill. Following graduation, he joined the Oncology Medicinal Chemistry group at GlaxoSmithKline in RTP, North Carolina. While at GSK, he was a member of multiple interdisciplinary teams focused on the discovery of novel small molecule ATP-competitive kinase inhibitors for the treatment of cancer. In 2008, he joined the Vanderbilt University Medical Center as Research Assistant Professor and the Vanderbilt Center for Neuroscience Drug Discovery as Associate Director of Medicinal Chemistry. While at Vanderbilt, Dr. Emmitte led several research efforts directed toward the design of novel small molecule allosteric modulators of G-protein coupled receptors for the treating disorders of the central nervous system. He then joined the faculty of the UNT System College of Pharmacy as Associate Professor in July 2015 and was promoted to Professor with tenure and accepted the position as Chair of the Department of Pharmaceutical Sciences in September 2018.

During more than twenty-two years in academic and industrial drug discovery research, he has directly mentored more than thirty different scientists of all education levels and has received numerous accolades and awards throughout his career. One of his most rewarding achievements as a faculty member was receiving the Pharmaceutical Sciences Professor of the Year Award from the UNT System College of Pharmacy Student Government Association in 2018, 2019, 2020, 2021, and 2022. As a scientist, his mGlu2 and mGlu3 NAM work was named one of the 10 Cool Inventions from 2014 by the Vanderbilt Center for Technology Transfer & Commercialization and he received the GSK Exceptional Science Award for sustained and key contributions to the discovery of GSK461364, a PLK1 inhibitor that advanced to clinical trials in cancer patients.

Dr. Emmitte's primary research interests encompass areas related to the design and optimization of biologically active small molecules to serve as in vivo probes, drug discovery leads, and optimized preclinical compounds. By nature, his work is highly collaborative and engages the areas of medicinal chemistry, molecular pharmacology, in vivo biology, and drug metabolism and includes collaborations on projects across a variety of therapeutic areas, including epilepsy, autism spectrum disorders, obesity, substance use disorder, and corneal trauma. To date, he is an author more than 68 peer-reviewed publications, including 27 as corresponding author. He is also an inventor on 21 issued U.S. patents. Portions of his recent research have been funded by the National Institute of Mental Health, National Institute of Neurological Disorders and Stroke, and the National Eye Institute.

Clinical Practice (IREB-250)

CP-001: Congestive Heart Failure Comprehensive Guide for Patients & Clinicians: A Systematic Review

Ingram, Kristopher S; Nguyen, Christina; Truong, Tyson; White, Annesha; Wesling, Megan; Wagner, Teresa

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Objectives: The objective of this study was to provide a comprehensive review of published studies on congestive heart failure (i.e., reduced ejection fraction only) to reflect the latest research, guidelines and tools for practitioners caring for patients. A secondary objective was to develop a pocket guide as a resource made up of conversion charts, instructions, and other basic information that can be referred to quickly by clinicians and shared with patients and their families.

Methods: Two or more reviewers will independently screen all citations and full-text articles. Data will be abstracted by one reviewer and checked by a second. We will use a standard data extraction form in Microsoft Excel to capture study characteristics and outcome data. Review authors will resolve any disagreements through discussion or, if required, will consult a third review author. One review author will extract the following study characteristics from the included studies, and an independent review author will check the extraction: Study eligibility, source, title, authors, methods, participants, interventions, outcomes, miscellaneous (e.g., key conclusions of the study authors, miscellaneous comments by the review authors). Data will be extracted and cross-checked by at least two authors independently. Data will be recorded in an Excel spreadsheet in a software system such as google sheets. Two or more review authors will resolve any disagreements through discussion or, if required, will consult a third review author. The systematic review will be conducted and reported in accordance with the PRISMA guidelines. Results will be graded to determine the quality of the scientific evidence using the Oxford Centre for Evidence-Based Medicine (CEBM).

Results: Results are pending, currently in title and abstract screening phase in the project.

Conclusion: The outcomes and conclusions are pending the results.

CP-002: Pharmacist Statin Prescribing For Patients With Type 2 Diabetes Mellitus

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PURPOSE: Statin therapy is recommended in patients 40-75 years with Type 2 Diabetes (T2D). The purpose of this study was to explore the impact of pharmacists on statin prescribing rates in a charity outpatient clinic. The study objectives were to: (1) identify patients with T2D and (2) perform a retrospective chart review to determine each patient's statin eligibility.

METHODS: Patients included were 18 years or older, diagnosed with T2D, and actively enrolled in clinical pharmacy services at Baylor Community Care Clinic - Fort Worth (BCCFW). Patients with Type 1 Diabetes or without a diagnosis of diabetes were excluded. Utilizing a list of 206 patients with T2D enrolled in pharmacy services, a retrospective chart

review was performed to determine statin eligibility. All patients not prescribed statin therapy were referred to student pharmacists, who completed a chart review to determine why statin therapy was not being utilized.

RESULTS: There were 206 patients who met the inclusion criteria, and 172 (83.5%) were already prescribed statin therapy. Thirty-four of 206 (16.5%) were not prescribed a statin, but most of these patients (31 of 34, 91.2%) did not qualify for statin therapy because of age or recommendations from other specialists (e.g., nephrologist). Therefore, only 3 of 206 patients (1.46%) were inappropriately missing a statin. This indicates that clinical pharmacists at BCCFW appropriately prescribed statins according to 2023 American Diabetes Association Standards of Care in Diabetes in 98.5% (203 of 206) of patients with T2D actively enrolled in pharmacy services.

CONCLUSION: According to the CDC, only 56.8% of adults with T2D aged 40-75 years were on statin therapy. In contrast, the BCCFW clinical pharmacy team appropriately prescribed statin therapy in 98.5% of patients.

CP-003: Current landscape in sickle cell disease pharmacotherapy in the United States

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Introduction: Sickle cell disease (SCD) is an inherited hematologic disease that results in dysfunctional hemoglobin production. The disease affects approximately 100,000 individuals in the United States, and mostly impacts individuals of African, Hispanic, Southern European, Middle Eastern, or Indian ancestry. The burden of SCD is high with estimated total medical cost of \$1.7 million in a nonelderly lifetime.

Body: The only cure for SCD is a bone marrow transplant. However, there are pharmacotherapy options available to manage symptoms and prevent complications. Hydroxyurea was approved in 1967, and for over 50 years was the only available therapy to reduce the frequency of painful crises. Since 2017, three additional pharmacotherapy agents have been approved: L-Glutamine, voxelotor and crizanlizumab. The objective of this review is to explore the current pharmacotherapy landscape for the management of SCD in the US.

Discussion: As of December 2023, there are four FDA approved therapies for SCD with 10 disease modifying agents in the global pipeline. Inclacumab, a full human IgG4 anti-P-selectin monoclonal antibody, is currently undergoing phase III trials with promising results. Available therapies have shown evidence in reducing painful vaso-occlusive crises and acute chest syndrome in pediatric and adult populations.

Conclusion: SCD is a debilitating and costly chronic disease state with significant long-term complications. The treatment landscape of SCD is expanding with several pharmacotherapy in addition to stem cell gene therapy options in the global pipeline for symptom management.

CP-004: Medication Use Evaluation of Total Parental Nutrition

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Background: Total parental nutrition (TPN) is a form of nutritional support used to treat malnourishment and to provide adequate nutrition. TPN is indicated for various clinical reasons, which mostly include when oral or enteral feedings are contraindicated or gastrointestinal impairment. Refeeding syndrome is one of the complications of TPN. It is defined as a shift in electrolytes due to the introduction of parental nutrition to malnourished patients.

Objective: To evaluate the appropriateness of TPN use and assess the risk of refeeding syndrome by observing electrolyte imbalance.

Methods: Single-center, 300-bed community hospital, retrospective study, patients who received TPN < 4 days were included between **.**

Results: 33% of patients reported having an inappropriate use of TPN, 58% of patients did not initiate enteral nutrition prior, and 29% of patients did not meet the criteria of malnutrition.

Conclusion: based on this study, incorporating ASPEN guideline during the ordering process may improve inappropriateness and health.

Research – Pharmaceutical & Basic Sciences (IREB-250)

RPBS-001: Pause the Clock: Unlocking the Key to Aging by Targeting the Glutaredoxin System

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The study investigates the roles of glutaredoxin 1 (Grx1) and glutaredoxin 2 (Grx2) in the lens, focusing on their influence on cellular senescence and associated age-related pathologies. Employing Grx1/Grx2 double knockout (DKO) mice, we aim to elucidate the molecular mechanisms contributing to lens aging and the emergent senescence phenotypes.

Primary lens epithelial cells (LECs) from both wild-type (WT) and DKO mice. DKO-derived LECs displayed signs of accelerated senescence, such as altered morphology, reduced proliferation, dysregulated cell cycle distribution, and increased senescence-associated β -galactosidase activity. Resistance to apoptosis in these cells was suggested by elevated Bcl-2 expression and the absence of cleaved caspase-3 under serum deprivation stress. Scratch wound healing assays revealed diminished migratory and proliferative capacities in DKO LECs compared to WT counterparts. Histological analyses with hematoxylin and eosin staining confirmed morphological disruptions in the DKO lens. Systemically, DKO mice exhibited faster aging including a more rapid onset of age-related cataract development, lower body mass, diminished physical vigor, premature graying of the fur, cardiac hypertrophy, brain enlargement, and reduced fertility.

Our findings revealed the critical involvement of Grx1 and Grx2 in maintaining lens epithelial cell homeostasis and preventing accelerated cellular senescence. The absence of these enzymes correlates with various systemic aging phenotypes, suggesting a broader role for glutaredoxin in the physiological aging process. These results highlight Grx 1 and

Grx2 as potential targets for therapeutic strategies aimed at mitigating senescence-associated ocular and systemic diseases.

RPBS-002: A Precise and In-Depth Protocol for Isolating and Culturing Primary Lens Epithelial Cells

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The lens epithelial cells (LECs) play multiple important roles in maintaining the homeostasis and normal function of the lens. LECs determine lens growth, development, size, and transparency. Conversely, dysfunctional LECs can lead to cataract formation and posterior capsule opacification (PCO). Consequently, establishing a robust primary LECs culture system is important to researchers engaged in lens development, biochemistry, cataract therapeutics, and PCO prevention. However, cultivating primary LECs has long presented challenges due to their limited availability, slow proliferation rate, and delicate nature. This study addresses these hurdles by presenting a comprehensive protocol for primary LECs culture. The protocol encompasses essential steps such as the formulation of an optimized culture medium, precise isolation of lens capsules, trypsinization techniques, subculture procedures, harvest protocols, and guidelines for storage and shipment. Throughout the culture process, cell morphology was monitored using phase-contrast microscopy. To confirm the authenticity of the cultured LECs, immunofluorescence assays were conducted to detect the presence and subcellular distribution of critical lens proteins, namely α A- and γ -crystallins. This detailed protocol equips researchers with a valuable resource for cultivating and characterizing primary LECs, enabling advancements in our comprehension of lens biology and the development of therapeutic strategies for lens-related disorders.

RPBS-003: Elucidating the Role of the Glutaredoxin System in Cellular Senescence: Insights from Grx1/Grx2 Double Knockout Mice

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Purpose: This study investigates the role of the glutaredoxin (Grx) system, comprising glutaredoxin 1 (Grx1) and glutaredoxin 2 (Grx2), in cellular senescence. Despite its known importance in redox regulation and thiol homeostasis, the Grx system's potential contribution to senescence is not well-understood. We employed Grx1 and Grx2 double knockout (DKO) mice to explore this role.

Methods: Primary lens epithelial cells (LECs) from both wild-type (WT) and DKO mice were examined for senescence markers (p53, p16, p21, PCNA, Phospho-RB, SASP, and Lamin B), mitochondrial function via Seahorse assays, and glucose metabolism using ¹³C isotopomer study by NMR spectroscopy.

Results: DKO LECs exhibited increased p53 levels and Phospho-RB, indicating a heightened senescent response and cell cycle disruption. Decreased Lamin B in DKO cells suggested changes in nuclear architecture associated with senescence. DKO cells also showed lower PCNA levels, aligning with reduced proliferation typical in senescent cells. Interestingly, markers like p16, p21, and SASP were unchanged in DKO and WT cells,

highlighting a specific impact of the Grx system in the lens. Moreover, DKO LECs displayed impaired mitochondrial function, evidenced by decreased ATP production, increased proton leak, and a potential disruption in the glycolysis pathway, as indicated by reduced ¹³C-labeled lactate from ¹³C glucose.

Conclusions: This study reveals the significant role of the Grx system in cellular aging. The alterations in key senescence markers (p53, Phospho-RB, Lamin B) in DKO LECs highlight the Grx system's influence on senescence. These findings offer new perspectives for targeting the Grx system in treating senescence-related diseases.

RPBS-004: Classification of CRISPR-Cas9 Proteins Using Structure-Based Machine Learning Model

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Purpose: CRISPR-Cas, an innate defense system in prokaryotes, has evolved into a gene editing technology with potential applications in correcting genetic diseases. Cas nucleases, key players in CRISPR, offer the ability to edit any gene of interest. While current therapies involve ex vivo editing, in-vivo editing is crucial for many genetic diseases. However, the challenge lies in the large size of CRISPR-Cas nucleases, necessitating the design of smaller "mini-Cas" proteins for effective in-vivo delivery. Our study pioneers a novel structure-based approach, employing machine learning models to differentiate Cas9 from non-Cas proteins. By utilizing 3D coordinates from known Cas9 crystal structures and high-quality predicted structures from AlphaFold2, we aim to identify specific residue pairs characteristic of Cas9. This insight can guide the design of compact and efficient mini-Cas9 proteins for improved delivery into target cells.

Method: We utilized a machine learning (ML) classifier called Random Forest (RF) to categorize Cas9 proteins using their C- α distance matrices (distance between a Carbons of amino acids in a protein) as structural features. Python scripts are used to calculate C- α to C- α distances between every pair of residues in the protein, creating a 2D residue-pair matrix representing all possible 210 pairs between the 20 known amino acids. These matrices were transformed into 1D linear vectors with each bit indicating the frequency of the corresponding residue pair in the entire Cas9 structure. This unique representation underwent SHAP feature selection, followed by RF classification of Cas9 vs. Non-Cas proteins. The SHAP feature selection process was averaged over 15 different data splits to identify crucial features (residue-pair distances) specific to Cas9. The models were evaluated using standard ML evaluation metrics like accuracy, precision, recall, F1-score, AUC score, and specificity.

Results: Our models achieved a high overall accuracy

RPBS-005: Unraveling the Molecular Nexus: Sleep Apnea and Glaucoma in a Rat Model

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Purpose: Over the past decade, meta-analyses have established a correlation between sleep apnea and glaucoma within the human populace. However, the link between these

pathologies remains elusive. Understanding the mechanisms involved could influence treatment options and reduce the rate of vision loss associated with glaucoma. Using a rat model of sleep apnea, chronic intermittent hypoxia (CIH), we tested the hypothesis that mild sleep apnea initiates morphologic and metabolic changes in the retina that resemble glaucoma.

Methods: Rats were randomly assigned to normoxic or CIH groups. The CIH group was exposed to periodic hypoxia during their sleep phase, simulating mild sleep apnea, with oxygen reduction from 21% to 10% and reoxygenation in 6-minute cycles over 8 hours/day for 14 days. The normoxic group experienced similar conditions without changes in oxygen concentration. Subsequently, the eyes were enucleated, and the retina was evaluated for oxidative stress, inflammatory markers, metabolic changes, and hypoxic response modulation using immunohistochemistry, capillary electrophoresis, and qPCR.

Results: Immunofluorescence revealed increased expression of 8-OHdG, indicating nucleic acid damage, and the cytokine TNF- α in the CIH group retina compared to controls. No statistically significant differences were observed in HIF-1 α and HIF-2 α protein or mRNA. SIRTUIN-1, a regulator of HIF-1 α expression and the levels of pyruvate dehydrogenase kinase-1 and lactate dehydrogenase-A showed no significant differences between normoxia and CIH.

Conclusion: The increased oxidative stress and inflammation observed suggest that CIH induces a response in the retina with features shared by early-stage glaucoma. However, the anticipated upregulation of HIF-1 α and its targets did not occur, suggesting a greater reduction in oxygen concentration or a longer-term CIH interval may be necessary to observe canonical hypoxic response.

Keywords: glaucoma, sleep apnea

RPBS-006: Synthesis and Pharmacological Evaluation of Benzimidazole-based Activators of Slack Potassium Channels.

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Purpose: Slack (Slo2.2) is a sodium-activated potassium channel widely expressed throughout the brain and encoded by the KCNT1 gene. This channel modulates the firing patterns and general excitability of many types of neurons. Increasing preclinical evidence suggests that channelopathies that alter Slack activity, contribute to cognitive dysfunction in Fragile X Syndrome (FXS), the most common cause of intellectual disability (ID) and inherited autism. Our research has identified the hit compound VU0519388 (VU388), which functions as a moderately potent Slack activator. Using established medicinal chemistry strategies, we hypothesize that we will be able to enhance its pharmacological properties to discover more potent and selective Slack channel activators that may serve as valuable tools to characterize the physiological role of the channel in neurological disorders such as FXS.

Method: Using short efficient synthetic routes, we carried out systematic substitution around the western benzimidazole ring to produce small libraries of analogs. A Bruker Fourier 300 MHz NMR spectrometer and an Agilent 6230 time-of-flight LC/MS were used

to confirm the structure and purity of all analogs. Functional activity was then evaluated using a Ti^+ flux assay in HEK-293 cells that stably express wild-type (WT) Slack channels.

Results: VU0519388, a benzimidazole-containing sulfonamide compound, showed moderate potency for Slack channel activation; however, substitution at various positions on the benzimidazole ring with a variety of electron-withdrawing and donating groups increased potency significantly.

Conclusion: Our systematic optimization plan has identified clear structure-activity relationships (SAR) and multiple Slack activator analogs with improved activity relative to VU388.

RPBS-007: Pregnancy-associated elevations in oxidative stress and inflammation are not associated with impaired maternal neuronal activity or memory function

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Introduction: The transition to motherhood is associated with neural and behavioral plasticity, inflammation, and oxidative stress during pregnancy and post-pregnancy. However, the effects of inflammation and oxidative stress on maternal neural and behavioral plasticity are unclear. We hypothesized that the maternal CA1, a brain region associated with cognition, would be protected from elevations in systemic inflammation and oxidative stress, mediating stable cognitive performance during pregnancy and post-pregnancy.

Methods: Cognitive performance was tested using novel object recognition, Morris Water Maze, and open field behavior tasks in female Sprague-Dawley rats of varying reproductive states [non-pregnant, late gestation (gestational day 20, term = 22-23 days), and two months post-pregnancy; n = 7-8/group]. Proinflammatory cytokines in plasma and CA1 were measured using a MILLIPLEX[®] magnetic bead assay. Plasma oxidative stress was measured using the advanced oxidative protein products (AOPP) assay. Oxidative stress and neuronal activity in CA1 were assessed via western blotting.

Results: There was no impact of pregnancy on cognitive performance in late gestation. However, spatial learning was impaired while exploratory behavior was enhanced post-pregnancy. In the CA1, oxidative stress markers were elevated during pregnancy and resolved post-pregnancy, while proinflammatory markers remained unchanged. Pregnancy did not impact CA1 neuronal activity.

Conclusions: Oxidative stress-associated markers, and not inflammatory cytokines, were elevated in the CA1 during healthy pregnancy, revealing a vulnerability of the maternal CA1 to oxidative stressors. Thus, peripartum elevations in oxidative stress, such as in pregnancy complications with hypoxic insults, may contribute to adverse neural and behavioral plasticity in the transition to motherhood.

RPBS-008: Contact Angle as a Tool to Assess Tumor ECM Hydrophobicity and Liposome Surface Activity

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Health disparities in breast cancer continue to be a challenging issue, with differences in survival rates among various demographic groups. These disparities are complex and may be influenced by biological, socioeconomic, and environmental factors. Among the biological factors, the extracellular matrix (ECM) is a critical component of tumor development providing mechanical support, modulating the microenvironment, and serving as a source of signaling molecules. We hypothesize that differences within the ECM structure could hinder the effectiveness of targeted tumor therapies, by diminishing their ability to reach the tumor site and reducing drug absorption ultimately leading to differences in outcomes. Here, we developed a method to assess ECM hydrophobicity using water contact angles and optimized a tissue decellularization process. In addition, we tested the effect of liposome composition on water contact angle using the same system.

Contact angles were measured on glass slides and breast cancer tissue sections using a customized optical goniometer. Samples were deparaffinized in xylene, ethanol, and water by consecutive washing cycles. Tissues were decellularized by up to three freeze-thaw cycles in water and 0.1% w/v Sodium Dodecyl Sulfate (SDS). The contact angle was measured after each decellularization step to determine the best tissue processing method. Additionally, water contact angles were measured on tissue sections both before and after treatment with liposomes.

Liposomes of various compositions were fabricated using the thin-film hydration method followed by sonication.

The optimum decellularization process was identified as two freeze-thaw cycles using water. After each cycle, the surface became progressively more hydrophobic. Liposomes reduced water contact angle both on glass slides and on tissue sections. The reduction in contact angle was composition-dependent. Contact angle may be used to analyze interactions between anti-cancer liposomes.

RPBS-009: Examining the Metabolic Relationship Between Retinal Ganglion Cells & Optic Nerve Head Astrocytes in Glaucoma

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Glaucoma is an optic neuropathy characterized by retinal ganglion cell (RGC) death and optic nerve degeneration. Glial cells such as astrocytes form a metabolic unit with neurons to exchange metabolic substrates and neurotransmitters. When exposed to ocular hypertension (OHT), this metabolic unit is disrupted as astrocytes undergo morphological changes in response to increased pressure. It is unknown how these changes impact RGC axon structure and function, so we aim to gain insight into the metabolic relationship between glia and neurons during glaucoma. We hypothesize that glaucoma induces metabolic strain in optic nerve head astrocytes (ONHAs), preventing the exchange of metabolites between neurons, ultimately causing a decline in RGC structure and function. To study these neural-glia interactions, we will isolate RGCs and ONHAs from offspring of GFAP-cre⁺ mice crossed with GLUT1fl/fl mice, placing them into co-culture to observe metabolic exchange when ONHAs are exposed to stretch stress. Because we have observed decreased GLUT1 expression following OHT, we will also study the impact of

glucose transport inhibition in ONHAs during glaucoma on RGCs by knocking out GLUT1 in ONHAs. To do this, we will add tamoxifen to the cells to activate the cre-recombinase, inducing the knockout of GLUT1. Preliminary results have shown RGCs can compensate for glucose transport inhibition in astrocytes by upregulating GLUT3 and MCT2. Using this model will allow us to directly observe the metabolic changes in the neural-glial unit induced by glaucoma, ultimately providing us insight into targets for future glaucoma therapies.

RPBS-010: Sex dependent effects of chronic intermittent hypoxia on mitochondrial oxidative stress and inflammation

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Obstructive sleep apnea (OSA) is a highly prevalent sleeping disorder in the USA with known sex differences in prevalence and severity. OSA is characterized by elevated oxidative stress (OS) and inflammation, mechanisms that involve mitochondrial function. This study addressed the role of sex and mitochondrial oxidative stress in OSA induced circulatory OS and inflammatory cytokines.

Adult Sprague-Dawley male and female rats were implanted with an osmotic pump containing either MitoTEMPOL (mitochondrial OS inhibitor) or saline and then exposed to a model of OSA, chronic intermittent hypoxia (CIH), or normoxic room-air for 14 days. At the conclusion of CIH, rats were sacrificed and plasma was collected to quantify markers of OS (Advanced Oxidized Protein Products, AOPP) and inflammation (pro-inflammatory IL6/ IL10 ratio).

Circulating OS was dependent on CIH and sex. Interestingly, the impact of CIH on OS was dependent on sex, wherein CIH decreased OS in females but increased OS in males. MitoTEMPOL blocked CIH induced OS effects only in males. In contrast to OS, CIH only increased the pro-inflammatory state (IL6/IL10 ratio) in females, which was blocked by inhibiting mitochondrial-associated OS.

These results indicate CIH-induced mechanisms underlying OS and inflammation are dependent on sex. Specifically, males experience a mitochondria-associated oxidative stress phenotype and females experience a mitochondria-associated inflammatory phenotype. These findings indicate that the OSA phenotype is sex-dependent, which may be related to the under-reported OSA incidence in women compared to men. Interestingly, inhibition of mitochondrial OS may be a potential drug target for both men and women with OSA.

Research – Public Health / Health Services / Outcomes (IREB-260)

RPH-001: Long COVID associated with poor mental health among adults in the United States.

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Background: Long-COVID may be associated with poor mental health due to neuroinflammation and other psychosocial factors due to the impact of the COVID-19 pandemic.

Objective: Examine the association of long-COVID with depression among adults (age>18 years) using near-real-time data from a recent (September 20-October 6,2023) nationally representative survey.

Methods: A cross-sectional analysis of real-world data (N=60,308) on adults from the Census household survey, representing ~197.4 million adults. Adults with missing data in long-COVID, depression, and anxiety were excluded. Long-COVID was derived from an affirmative answer to a question about symptoms (for example: tiredness, difficulty breathing, pain, and heart palpitations) lasting longer than 3 months. Depression was derived from patient health questionnaire. Multivariable logistic regressions analyzed the association of long-covid with depression after adjusting for gender, age, race, ethnicity, social determinants of health-SDOH (education, poverty status, food sufficiency, health insurance, marital status, and region), and stress due to inflation.

Results: Among US adults, 15.2% had long-COVID; 40.8% had acute COVID; 44% had no COVID; 22.5% reported depression. 83.2% had COVID vaccination. Among adults with COVID-19 vaccination, 15.4% had long-COVID. A higher percentage of adults with long-COVID reported depression (34.8% vs 22.8%, $p < 0.001$) compared to those without COVID. After adjustment for other covariates, adults with Long-COVID were more likely to report depression (aOR=1.78, 95%CI=1.57, 2.01) compared to those without COVID.

Conclusion: Approximately one in 5 adults reported depression even after the end of the COVID-19 pandemic. Long-COVID was associated with depression. Adults with long-COVID may need routine evaluation for major depression and possible mental health treatments.

RPH-002: Long-COVID and Health Related Quality of Life (HRQoL) among adults in the United States: Cross-sectional Analysis of the 2022 Behavioral Risk Factor Surveillance System Survey

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Background: A systematic investigation of long-COVID on Health-related Quality of life (HRQoL) with representative data is limited.

Objective: Determine the association of long-COVID with HRQoL among adults in the US.
Methods: A cross-sectional analysis of data on adults (age>18 years; N = 309,984) from 2022 Behavioral Risk Factor Surveillance System telephone survey. We used the validated CDC HRQOL-4 measures and a standard cutoff point of >14 poor physical and mental health days represented poor HRQoL. A composite index (range 0 to 4) with a cutoff point of >3 represented poor HRQoL. Separate multivariable logistic regressions assessed the relationship of long COVID with poor HRQoL after adjusting for selected variables (age, sex, race, ethnicity, social determinants of health, chronic conditions, and lifestyle factors) that may affect long-COVID and HRQoL.

Results: 7.5% (~12.32 million) of adults reported long-COVID; 12.6% and 15.5% reported poor physical and mental health respectively. A higher percentage of those with long-

COVID reported poor physical (20.4% vs. 12.6%) and mental (25.2% vs 14.7%) health, activity limitations (16.3% vs 9.7%), and poor HRQoL based on summary score (12.8% vs. 7.4%) compared to those without COVID. In adjusted analyses, adults with long-COVID were more likely to report poor physical (aOR=1.70, 95%CI=1.56,1.86) and mental (aOR = 1.47, 95%CI=1.37,1.58) health, activity limitations (aOR = 1.60, 95% CI=1.45,1.76), and poor HRQoL (aOR = 1.63, 95%CI=1.46,1.82).

Conclusion: Approximately one in 13 adults experienced long-COVID. Long-COVID was associated with poor HRQoL along multiple dimensions. Long-COVID patients need to be routinely evaluated for poor HRQoL.

RPH-003: Long COVID and Severe Cognitive Limitations among US Adults: Insights from a recent National Survey in the United States

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Background: Long COVID is characterized by persistent symptoms experienced by individuals following the resolution of an acute COVID-19 infection. Long COVID may affect cognition due to possible ischemia, neuro-inflammation, and hypoxia related to COVID-19.

Primary Objective: Assess the association of long COVID with severe cognitive limitations using a nationally representative US survey.

Methods: Utilizing data from the September 20 - October 2, 2023 Census Household Pulse Survey among adults aged > 18, COVID-19 cases were categorized as long COVID, short COVID, or no COVID. Cognitive limitations were classified into two groups: 1) no or some difficulty and 2) severe or very severe difficulty remembering or concentrating. Chi-square tests and multivariable multinomial logistic regressions were used to analyze the association of cognitive limitations with type of COVID diagnosis after controlling for age, sex, social determinants of health (SDoH), lifestyle characteristics, and COVID-19 vaccination status. Adults were excluded if they had missing data on long COVID, COVID, and cognition variables or if they had COVID in the past 4 weeks.

Results: Among US adults, nearly 3 million (15.1%) reported experiencing long COVID. Of these, 1.2 million (6.4%) experienced severe or very severe cognitive limitations. In fully adjusted models, individuals with long COVID exhibited a higher odds of severe or very severe cognitive limitations (aOR=2.50, 95% CI=2.09, 2.98) compared no COVID.

Conclusion: Individuals who reported long COVID were more likely to have severe or very severe cognitive limitations. Adults with long COVID may need close monitoring of cognitive functioning to prevent negative sequelae.

RPH-004: Improving Patient Readability and Understanding of Medication Labels: A Systematic Review

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Objective: The aim of this study is to systematically review the current literature to summarize patient views on how they read medication labels, identify safety related

challenges in reading labels, and highlight strategies to reduce medication errors due to misreading labels.

Methods: This systematic review was conducted using PubMed and Embase databases to obtain articles published from 2013 to 2023. Search terms included: "patients reading medication labels" and "adult"; "patient safety and prescription labeling and adult"; "patient perspectives" and "medication labels" and "adult"; "patients" and "ability to read and understand" and "medication labels" and "adult"; "label readability" and "patients" and "adult"; "drug labeling" and "drug label comprehension" and "adult"; "patient involvement in tool design and medication label and adult"; "health literacy" and "medication labels" and "patients" and "adult"; "drug label comprehension" and "adult" and "patient safety". Two authors independently assessed the results of each database and disagreements were resolved through discussion. A PRISMA flow diagram was used to evaluate the process. Articles were summarized in a table organized by author(s), year published, title, study design, characteristics of study sample, approaches to measuring patient outcomes, patient understanding of label content, patient safety challenges, strategies to reduce medication errors, and cost. The quality of articles was graded using the Oxford for Evidence-based Medicine scale.

Results/Conclusion: Research in progress, results are pending based on review of full text articles.

RPH-005: A Systematic Review of Medication Costs and Affordability Associated with Congestive Heart Failure

Nguyen, Christina; Ingram, Kristopher; Truong, Tyson; White, Annesha; Wesling, Megan; Wagner, Teresa

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Objective: The objective of this study was to perform a systematic review of published studies on medication costs and affordability related to congestive heart failure (reduced ejection fraction only) to highlight the increasing cost impact of congestive heart failure.

Methods: This systematic review was conducted using PubMed, MEDLINE, EMBASE, and CINAHL. Published articles were obtained from 2012 to 2023. Search terms included "CHF and medication costs" and "CHF and medication costs and affordability". Abstracts were screened according to inclusion and exclusion criteria (i.e., language restricted to English and adults only (18 years or older). Search findings were reported in a PRISMA diagram. The titles and abstracts of studies retrieved in Covidence during the search were screened independently by two reviewers. The full-texts of potentially relevant studies were then reviewed by two reviewers according to the eligibility criteria. The next steps will include a review of the full text of relevant studies. Data will be extracted to develop a table that will include the author, year of publication, study design, characteristics of the sample, disease states, and economic outcomes. The quality of the evidence will be assessed using the Consolidated Health Economic Evaluation Reporting Standards (CHEERS).

Results/Conclusion: Research in progress. The review process thus far yielded 70 articles. This important study will shed light on the economic impact of congestive heart failure including hospitalization trends, readmissions, and outpatient trends to improve patient health outcomes.

RPH-006: Association of Multimorbidity with Frequent Marijuana Use among Adults in the United States

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Background: Adults with multiple chronic conditions may use marijuana to relieve pain, improve sleep and anxiety caused by chronic conditions. There is limited literature exploring the association between multimorbidity and marijuana use.

Objective: This study examined the association of multimorbidity with frequency of marijuana use using 2021 National Survey of Drug Use and Health (NSDUH).

Methods: A cross-sectional analysis of 37,014 adults representing 228.4 million. Frequent marijuana use in the past year was grouped into three categories (no use, <180 days, and ≥180 days). Multivariable multi-nominal logistic regressions were used to analyze the association of multimorbidity (defined as the concurrent presence of two or more chronic conditions) with frequent marijuana use after adjusting for demographic factors (age, sex, race, and ethnicity) and social determinants of health (education, employment, poverty, and metropolitan status), nicotine dependence, pain medication use, and obesity.

Results: Overall, 21.2% had multimorbidity, and 7.1% were frequent marijuana users. In bivariate analysis, there were no differences in frequent marijuana use among those with multimorbidity (6.2% vs. 7.0%) and those without any chronic conditions. Once adjustments were made for age and sex, those with multimorbidity were more likely to be frequent marijuana users (aOR=1.74,95%CI=1.38,2.19) compared to those without any chronic conditions. In fully adjusted model, the relationship remained consistent (aOR=1.41,95%CI=1.08,1.83).

Conclusion: One in 20 adults with multimorbidity were frequent marijuana users. Multimorbidity was associated with frequent marijuana use. Given the emerging evidence of harmful effects of marijuana on physical and mental health conditions, future research needs to evaluate the effects of frequent marijuana use on health outcomes.

Service (IREB-260)

S-001: Each Needs The Help of the Other: The Impact of Phi Delta Chi on the University of North Texas Health Science Center College of Pharmacy

Lange, Wyatt; Ingram, Kristopher, S; McKeefer, Haley JM

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The Phi Delta Chi (PDC) Professional Pharmacy Fraternity mission is to provide a lifelong home for pharmacy professionals that inspire our founding values of Brotherhood, Leadership, Scholarship, and Service. The Delta Beta Chapter organizes many service events each year for our fraternity's philanthropy, St. Jude Children's Research Hospital. We also take great pride in 'Serving Others First' by addressing water insecurity on our campus and in the Jackson, MS community through monetary donation drives in collaboration with the PDC chapter Alpha Epsilon. In our chapter's 2023 Pharmacy

Showcase poster, our Brothers will share how we live our motto "Each needs the help of the other" through our service events.

S-002: Synergistic Care for an Underserved Population: Exploring the Impact of Interprofessional Medical and Pharmacy Collaboration

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Underserved communities can have unique challenges to accessing healthcare. In response, we present a collaborative effort between Student Society of Health-System Pharmacists (SSHP) and Homeless Outreach through Medical Education (HOME), a free, student-led clinic operated by the Texas College of Osteopathic Medicine (TCOM). We aim to provide patient education to a population that frequently has difficulty accessing healthcare, foster interprofessional education and elevate standards of patient-centered care at the clinic. Our primary objective is to Assess the impact of interprofessional collaboration between medical and pharmacy students at the HOME clinic. Our secondary objective is to evaluate the confidence levels of medical and pharmacy students in their ability to implement interprofessional team work. Each student physician and pharmacist was given a Likert Scale survey with each statement tied to a key measure. A pre and post collaboration survey was given to each participant. Unpaired t-tests were used to compare pre- and post- mean. Both student physicians' and pharmacists' understanding of the role of the other profession in patient care increased. In addition, student physicians' acknowledged a desire to continue interprofessional collaborations at the HOME clinic. Future interprofessional events will include additional healthcare professionals such as nursing, physician assistants, and physical therapy students. Finally, student participants believed that interprofessional collaboration can improve care to underserved populations.

Teaching & Education (IREB-260)

TE-001: WellnessRx: The Prescription for Pharmacy Residency Program Success

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The American Society of Health-System Pharmacists (ASHP) revised its standards for ASHP-accredited residency programs in relation to resilience and wellbeing. Residency programs are now required to assess resident wellness and resilience through development plans. This study seeks to define resident wellbeing and explore wellness initiatives and practices that are integrated into pharmacy residency programs, with a particular focus on their impact on resident wellbeing. By examining the strategies, resources, and outcomes associated with wellness in pharmacy residencies, this research aims to provide valuable insights that can inform the design and implementation of effective wellness programs to enhance the overall experience and success of pharmacy residents. A systematic literature review included a search of multiple databases. Articles

were included if they discussed pharmacy residency in the context of wellness, burnout, or resiliency. Studies were then grouped into wellbeing categories, including burnout, wellbeing measures, and wellbeing programs. Difficulties with pharmacy resident wellbeing are well-documented throughout the literature, which sparked ASHP to adjust residency accreditation standards. However, there are still some questions that need exploring. The long-term effects of the COVID-19 pandemic on pharmacy residency wellbeing have not been measured to determine potential changes in burnout and wellbeing. Additionally, the residency wellbeing programs described in the literature have robust curriculum explanations and include resident perceptions data. While resident perceptions are valuable, it is also important to show improvements in resident wellbeing measures, such as burnout or depression rates, to further aid residency programs in building their wellbeing solutions.

TE-002: SEEDing the Path to Pharmacy Student Excellence: Integration of Students in the Planting of a Co-Curricular Skill Development Program

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The Accreditation Council for Pharmacy Education (ACPE) mandates that pharmacy schools align co-curricular experiences with the Center for the Advancement of Pharmacy Education (CAPE) educational domains to develop career readiness skills. To augment career-readiness skills, the University of North Texas Health Science Center College of Pharmacy (UNTHSCCP) has created an innovative program that integrates co-curricular activities into didactic coursework. The Skill Enhancement and Development (SEED) program was built by faculty, staff, and students using six CAPE educational domains. The SEED program uses two frameworks: curricular integration and continuing education. The leadership domain menu was developed and piloted to PY1 students in 2021-2022 because the gap analysis identified leadership as the domain with the least dedicated curricular sessions. All six domain menus with continuing education credits (CCE) options were piloted with PY1 and PY2 students in 2022-2023.

The SEED program provides a structured approach and prepares students for pharmacy job interviews and careers. It includes curricular sessions and a continuing education program for students to obtain credits outside of curricular sessions. Student organizations played a major role in providing CCE options through submission of 54 organization events. The Co-Curricular Committee at UNTHSCCP, with the help of pharmacy students, has built an innovative program to provide a comprehensive educational experience. Future directions include clarification of the innovation/entrepreneurship domain to provide better guidance for incorporation of these concepts into student organization events, implementation of curricular changes for the PY2 and PY3 academic years, and an assessment of career placement.

TE-003: From Seedlings to Leaders: An Assessment of Student Activity Submissions for the Co-Curricular SEED Program

Noska, Brianna; Liu, Haoxin; Ghor, Rashida; Makumbi, Ronald; Suh, Eul; Machu, Tina; Coyle, Russell; Torres, Brittany P

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The Health Science Center College of Pharmacy instituted co-curricular programs to advance offerings in pharmacy student personal and professional development. The Skill Enhancement and Extracurricular Development (SEED) program was developed for P1-P3 students using the pharmacist continuing education model to incorporate the educator, includer, self-evaluator, leader, innovator, and professional subdomains. The leadership subdomain was piloted in Fall 2021 and the other five were piloted in Fall 2022. Students were given a menu of optional activities to complete for each subdomain. Each activity, based on the "difficulty" to achieve it, was given a certain amount of co-curricular continuing education (CCE) credit. Three total CCE credits per subdomain are required each year. A SEED Canvas course was used to collect student data and they uploaded answers related to event or assignment logistics and pre-built reflections. For the leadership pilot in 2021, there were 190 total Canvas submissions. The majority of students submitted the following items for CCE credit: student organization membership (131 submissions, 81%), other leadership experiences (9 submissions, 5.6%), and student organization officer (6 submissions, 3.7%). There were four menu items for which no students submitted including attending an online leadership training, regional or national student organization leadership, advancement in the Texas Society of Health-System Pharmacists Leadership Competition, and participation in the Academy of Managed Care Pharmacy Pharmacy and Therapeutics Competition.

TE-004: Fostering psychosocial and diabetes self-management skills among pharmacy students through a hybrid advanced diabetes elective course

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Introduction: Pharmacists are the most accessible and frequently visited healthcare professionals in the US. Pharmacy school programs contain required course content in diabetes management. However, students desire additional experience with self-management skills and activities that promote empathy, patient advocacy, and effective communication. An elective course was created to provide pharmacy students with first-hand experience in diabetes self-management skills and the psychosocial/behavioral aspects of diabetes care.

Methods: As a primary objective, the investigators describe three simulation activities (carbohydrate counting, insulin calculation/medication adherence and saline self-injection) and evaluate student performance via a capstone OSCE assessment and the completion of the APhA certificate course "The Pharmacist and Patient-Centered Diabetes Care". The certificate requirements were integrated throughout the elective course session and activities.

Student demographics and grades from four completed cohorts were evaluated, and presented in aggregate form via descriptive statistics utilizing the SPSS platform. Student comments and perceptions were also included.

Results: 111 students completed the four course cohorts. Average OSCE scores were 92.5% for the patient case and 89.5% for the hands-on skill assessment. 99.1% of students successfully completed and obtained the certificate from the APhA program. Students also reported improved understanding and empathy for patients with diabetes.

Conclusions: The simulation and OSCE activities allowed students to become more proficient in comprehensive diabetes care as evidenced by course grades, and the self-care activities promoted patient empathy. Achievement of the APhA diabetes care certificate also provided evidence of proficiency in various aspects of diabetes care, which gives students an advantage in the competitive job market post graduation.

TE-005: Type II Diabetes Mellitus and COVID-19: A Case Series Exploring Insulin Management in Patients from Two Family Medicine Clinics

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About 37 million Americans have diabetes and out of this population, over 90% of them have type 2 diabetes. An estimated \$200 billion per year is spent on managing this disease. The pandemic may have increased that estimate due to changes in treatment access. There is limited data on factors that could explain whether diabetic patients experienced better HgbA1C control during the COVID-19 pandemic. The relationship between diabetes medications (DM) and diabetes outcomes during the COVID era is not well-characterized. In this case series, we aimed to evaluate type II diabetes outcomes pre COVID- 19 vs. COVID-19 era.

This case series demonstrates how two family medicine clinics treated diabetic patients during a pandemic. The majority were using insulin throughout the COVID-19 era and did experience changes to their medication profile with other DM medications. A1c levels did change significantly from pre-COVID-19 to the COVID-19 era, while prescriptions for diabetic treatment were reduced. This study identified the importance of keeping insulin and other DM medication prescriptions through a pandemic. The impact of COVID-19 on hemoglobin A1c was dependent on diabetic care received.

TE-006: Pharmacy Student Involvement in Interprofessional Patient Education

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Introduction: The AACCP Curriculum Outcomes and Entrustable Professional Activities highlight communication skills and interprofessional collaboration as important educational outcomes for pharmacy students. The pharmacy curriculum provides opportunities to practice these skills via didactic instruction and experiential training. However, pharmacy students can benefit from additional exposure to "real-world" patient education programs. The objective of this presentation is to describe how pharmacy students have been integrated into an interdisciplinary diabetes education program.

Methods and Results: The HSC Health Diabetes Self-Management Education and Support (DSMES) program provides evidence-based education to geriatric patients in the DFW Metroplex. The interdisciplinary program faculty is comprised of a pharmacist, nurse

practitioner, dietician, physical therapists and a social worker. The program offers individual and group classes quarterly and is accredited by the American Diabetes Association.

42 students from the HSC College of Pharmacy, HSC physical therapy program and neighboring dietetic programs volunteered in the DSMES program from 2021 to 2023. Students attended a 90-minute education session followed by a 30-minute student-led individual goal-setting session. During the session students reviewed previous participant goals, identified current diabetes care issues, collaborated to set new SMART goals and identified the participant's level of confidence in achieving set goals. Students provided evidence of HIPAA training, signed HIPAA confidentiality forms and received training from the program coordinator prior to the sessions.

Conclusion: The HSC Health DSMES program provided pharmacy students the opportunity to participate in interdisciplinary patient education, model communication and motivational interviewing skills and interact with patients in their local community.

THANK YOU SO MUCH FOR JOINING US TODAY!

We wish to extend a very special “Thank you” to our awesome judges!

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We also wish to express our sincere appreciation for our volunteers!

Thank you to all of our poster presenters, co-authors and mentors! We are so proud of you.

Thank you to Drs. White and Madhavan for providing funding for this event.

Thank you to all of our event attendees for joining us to celebrate.

Sincerely,

The Showcase Event Organizers:

Krista Roberts

Brenda Sihotang

Austin Luna

Rebecca Cunningham

Usha Sambamoorthi

Jerry Simecka

Donna Coyle

Meredith Howard

Shea Patterson

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