Welcome to the 2023 VCOM Research Retreat, hosted by the Edward Via College of Osteopathic Medicine (VCOM)-Auburn campus!

Since its inaugural class graduated in 2019, the VCOM-Auburn Campus has consistently grown its research portfolio, demonstrating its commitment to advancing scientific knowledge. Located in the Auburn University (AU) Research Foundation Park, VCOM-Auburn collaborates closely with the AU School of Kinesiology, Samuel Ginn College of Engineering, Harrison College of Pharmacy, School of Nursing, and College of Veterinary Medicine. Sharing a common rural mission, VCOM and AU are also strategic partners with the University of Alabama, Hughston Foundation, James Andrews Research Foundation, Hudson Alpha Institute for Biotechnology, and Alabama Department of Public Health. This commitment to health science research has helped Auburn University rise into the top 100 US colleges and universities.

The VCOM-Auburn campus offers unique research opportunities, including state-of-the-art MRI facilities, such as a 3T and an exclusive 7T Siemens MRI for animal and human research studies. The research landscape at VCOM-Auburn encompasses diverse focus areas, including One Health, Biomedical Engineering, Chronic Disease, Imaging, and Musculoskeletal Research.

In keeping with VCOM’s dedication to cutting-edge research, the 2023 Research Retreat agenda includes keynotes on Artificial Intelligence and Deep Learning and MedX Talks offering insights into the latest advancements. This year's retreat introduces unique elements, such as department breakout sessions led by VCOM-Auburn faculty, exclusive facilities tours, and a strong lineup of AU partnerships represented among the keynote and program speakers. Dr. Brock has thoughtfully curated other distinctive features, including department breakout sessions, to facilitate discussions and ensure your visit to the VCOM-Auburn campus is memorable and productive.

If you have any specific needs during your stay, please feel free to contact us; we are here to assist you.
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## 2023 VCOM Research Retreat Agenda

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**VCOM-Auburn**

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<td>Peter F. Hiestand, DC, PhD, Former Director of the National Center for</td>
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<td>Jim Mahaney, PhD; Lisa Carroll, MD, Ray Romano, DO; Dinesh Aryal, PhD</td>
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<td>11:00 am – 12:00 pm</td>
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<td>Clinical Trials &amp; Tribulations: When Noncompliance Yields Disastrous</td>
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<td>Forming Future Physicians for the VCOM Mission, MPR 128</td>
<td>Bill Pearson, PhD; Jody Brewer, PhD; Mary Piscara, PhD</td>
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<td>Inflammation and Autoimmunity, Room 412</td>
<td>Chris Reilly, PhD; Kelly Roballo, PhD; Blaise Costa, PhD</td>
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<td>Techniques to Study Nucleic Acid-protein Interactions, Room 323</td>
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<td>Poster Session &amp; refreshments (Facility tours are also available during</td>
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<td>Cell Biology and Physiology, Lecture Hall I</td>
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<td>Internal Medicine, Sim Room 412</td>
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<td>OMM, OMM Lab Room 426</td>
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<td>Biostats Consultation, Room 228</td>
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<td>One-on-one consultations, main lobby†</td>
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# 2023 VCOM Research Retreat Agenda

**Sunday, November 5th**  
**VCOM-Auburn**

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<td>MPR Room 126-128</td>
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<td>Andrew Albrecht, CEO, AUBix, LLC</td>
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<td>Kenny Brock, DVM, PhD</td>
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<tr>
<td>8:15 – 9:00 am</td>
<td>Biostatistics in Student Medical Research</td>
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<td>MPR Room 126-128</td>
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<td></td>
<td>David Redden, PhD</td>
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<td>Panel: Lin Kang, PhD; Ramu Anandakrishnan, PhD, P. Gunnar Brolinson, DO</td>
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<td>9:00 – 9:15 am</td>
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<td>Pawel Michalak, PhD</td>
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† During the Departmental Breakout sessions, Research Department staff will be available for individual consultations on a drop-in basis: Nick Buhl (data management and computer access); Katherine Hanson (IRBNet); Greg Reaves, Eryn Perry, Jennifer Arnold, Jessica Muller (research and grant development).

**ACCREDITATION:**
*This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of the American Osteopathic Association (AOA) and Edward Via College of Osteopathic Medicine (VCOM). The American Osteopathic Association is accredited by the ACCME to provide continuing medical education for physicians.

**CREDIT HOURS:**
The American Osteopathic Association designates this live activity for a maximum of 5.75 **AMA PRA Category 1 Credit™**. Physicians should claim only credit commensurate with the extent of their participation in the activity.

**DISCLOSURE AND CONFLICT OF INTEREST RESOLUTION:**
All conflicts of interest of any individual(s) in a position to control the content of this CME activity will be identified and resolved prior to this educational activity being provided. Disclosure about provider and faculty relationships, or the lack thereof, will be provided to learners.

**ATTESTATION INFORMATION**
For those earning CME credits, please visit the links below to complete your attestation and evaluation of the CME-accredited activities.

CME presenter evaluations: [https://virginiatech.questionpro.com/t/AVBnOZ0OD4](https://virginiatech.questionpro.com/t/AVBnOZ0OD4)

CME Attestation Form for AOA/AMA: [https://virginiatech.questionpro.com/t/AVBnOZ0OD2](https://virginiatech.questionpro.com/t/AVBnOZ0OD2)

Note: The CME Attestation Form must be completed by November 30, 2023.
Partap S. Khalsa (aka Peter Hiestand) is a clinician-scientist, who retired in 2022 from the National Institutes of Health (NIH) as the Director of the Division of Extramural Activities (DEA) (2017-2022) at the National Center for Complementary and Integrative Health (NCCIH). As the NCCIH DEA Director, Dr. Khalsa also served as the Executive Secretary for the National Advisory Council for Complementary and Integrative Health, and as a member of a number of key NIH committees. Dr. Khalsa also served at NCCIH as the Deputy Director of the Division of Extramural Research (2014-2016), and as a Program Director (2006-2013). Prior to joining NIH, Dr. Khalsa was a tenured Associate Professor (2003-2006) in the Department of Biomedical Engineering, State University of New York at Stony Brook (1997-2003 tenure-track Assistant Professor), where he was the Graduate Program Director for Biomedical Engineering and the Vice-Chair of the BME Department. His original research was funded by the NIH, New York State Center for Advanced Technologies, and the Whitaker Foundation. He did a postdoctoral fellowship in neuroscience at Yale University Medical School (1995-1997), and prior to that did his doctoral research in neurophysiology and biomechanics at the University of Massachusetts Medical School and WPI (1992-1995). Dr. Khalsa received a master’s degree in biomedical engineering from Boston University (1990-1992). Dr. Khalsa was the founder and director of 2 chiropractic clinics in Massachusetts, board-certified in chiropractic orthopedics, and served as President of the Boston Chiropractic Society (1984-1986). During his scientific career, he regularly provided peer-review activities for scientific journals, and served as an associate editor for Spine, The Spine Journal, The Pain Journal, and the Journal of Manipulative and Physiological Therapeutics, and published numerous original research in these and other journals.
Andrew Albrecht, CEO
Co-Founder & Chief Executive Officer, AUBix

Sunday Keynote: Connectivity, Digital Parity, and Rural Health
With Kenny Brock, DVM, PhD.

Andrew Albrecht has more than 20 years of entrepreneurial and corporate experience in the technology and software industry, emphasizing data centers, cybersecurity, and SaaS. Andrew leads AUBix as a proven technology executive in the data center industry. He is responsible for developing and leading the company’s strategy of bringing technology parity to the edge through overseeing sales, operations, and finance.

Andrew graduated from the Harbert College of Business at Auburn University with a BS in Finance. He now resides in Auburn, AL, with his wife and two daughters.
MEDx Talks

Kevin Hayes, DO
VCOM - Auburn

*The Rule of the Artery*

Mary Piscura, PhD
VCOM - Auburn

*Of Mice and Men: Dreaming of Translatable Outcomes from Preclinical Pain Studies*

Dinesh Aryal, PhD
VCOM - Louisiana

*New Wrinkles in Hypertension Management*

Pawel Michalak, PhD
VCOM - Louisiana

*Go viral: Pandemic-driven research at VCOM*
Bidyut Mohanty, PhD  
VCOM - Carolinas  
An Old Enzyme With A New Usage

Ray Romano, DO  
VCOM - Carolinas  
How to be a Mentor for a Case Report

Jim Mahaney, PhD and Lisa Carroll, MD  
VCOM - Virginia and Carolinas  
Evaluation of the Vaginal Microbiome to Estimate Vaginal Health in Gynecology Patients Presenting with Vaginitis
1. **Clinical Trials & Tribulations - When Noncompliance Yields Disastrous Outcomes**

David Moore, DVM, PhD and P. Gunnar Brolinson, DO

During a gene therapy clinical trial, one subject died. It was subsequently determined that the PIs did not follow their approved protocol, failed to communicate problems to IRBs and the FDA, and exposed subjects to unnecessary risks. This workshop will detail the identified problems to provide workshop participants with a roadmap of what mistakes to avoid during clinical trials.

This session will include a 45-50-minute PowerPoint presentation of the case, focusing on deficiencies and non-compliant items identified by the FDA. A panel and audience discussion and Q&A on patient care and IRB compliance will follow.

The target audience for this Workshop is physicians and researchers with a basic understanding of federal laws and regulations related to clinical trials.

2. **Forming Future Physicians for the VCOM Mission**

Bill Pearson, PhD; Jody Brewer, PhD and Mary Piscura, PhD

Medical student burnout drives students away from primary care. Positive learning experiences reduce burnout, enhance empathy, and strengthen commitment to patient care. VCOM has a unique opportunity to lead scholarship in physician formation and foster a supportive training environment for all stakeholders.

This interactive workshop will lay a philosophical foundation for flourishing in medical education, explore the practical implementation of developmental evaluation (DE), and provide real-world examples of its impact. Participants will conceptualize and design a scholarly DE project, navigate the IRB approval and publication process, and network with peers to support project success. Join this workshop for medical educators committed to shaping flourishing physicians. Promote a flourishing approach to physician formation and enhance student recruitment, faculty retention, and VCOM’s missional impact.
Autoimmune diseases affect 10% of the global population, but the cause is unknown. This workshop will explore autoimmunity and inflammation from different perspectives, with a focus on systemic lupus erythematosus, peripheral nerve transplantation, and Anti-NMDA receptor encephalitis.

Dr. Reilly, Dr. Roballo, and Dr. Costa will each present a 20-25 minute talk on their research, with time for questions. This workshop is for researchers and physicians interested in learning more about inflammation and autoimmune response in the renal and nervous system.

DNA, the genetic material, regulates all processes on DNA and plays a role in preventing genetic diseases including cancer. Noncanonical DNA structures can threaten genome integrity, and the new ExoChew technique can generate single-stranded DNA libraries to study these structures. This workshop will discuss ExoChew, DNA-protein interactions, and the scope of CD spectroscopy for chiral properties of DNA and proteins.

This workshop is for researchers interested in nucleic acid-protein interactions involved in transcription, DNA replication, recombination, and repair that control genome integrity. There will be 10-minute presentations (45 minutes total), followed by 10 minutes of discussion.

This workshop will foster information exchange on OMS-II student research at VCOM campuses, share faculty development strategies, and build new strategies to be shared with Research Administration. Focusing on the optional OMS-II student research experience, with foundational concepts complementary to OMS-III/IV student research experiences, such as Research Rotations and D.O. with Research Distinction.

Participants will share practices and insights on onboarding, organizing milestones, student management, setting expectations, and facilitating research continuity. Strengths, opportunities, barriers, and gaps will be explored to generate ideas for improvement. This inclusive and diverse workshop aims to support faculty mentors and OMS-II students in enhancing the research experience on all VCOM campuses.

Target audience: Faculty and staff who want to brainstorm and articulate practical ways to augment research experiences for research mentors and OMS-II students.
Lab Tours

Concurrently with the poster session, we will offer brief lab tours during the event. This is an excellent opportunity to learn more about the research being conducted in our labs and to meet the researchers behind the work.

Tours will be offered on a first-come, first-served basis, and each tour will last approximately 15 minutes between 2:30-3:30 PM. Please sign up for a tour at the registration desk at the beginning of the poster session.

FAROUT Lab

*Functional Anatomy Research in Osteopathic Understanding and Treatment*

The FAROUT Lab is focused on exploring and improving osteopathic health through an interdisciplinary and technology-driven approach. FAROUT Lab research is centered on the comprehensive analysis of myofascial tissue properties, the development of non-opioid treatments for pain, and understanding the impacts of osteopathic manipulative medicine on overall patient health and outcomes. Our lab equipment includes a SuperSonic Mach40 Ultrasound System, Vicon Optical Motion Capture Setup, Rokoko IMU Motion Capture Suit, MyotonPRO Digital Palpation Device, iMotions Biometric Data Technology, and an Emed Pressure Measurement Platform.

SIM Center

The VCOM-Auburn Sim Center serves the VCOM DO program and Bluefield Anesthesia assistant program. The center also develops new technologies and provides students with the SIM playground to practice skills on an ongoing basis.
Presenter: Stephen DiGiuseppe, PhD  
Co-Authors: Kasia Michalak, MS, Nathaniel Stansbury*, J Jones, Rebekah Morrow, PhD, MA Arnold  

*VCOM Student

Interferon-mediated restriction of rotavirus replication is dependent on NSP1

Rotaviruses are spread by fecal-oral transmission and infect mature enterocytes of the small intestinal villi. Group A rotaviruses have a broad host range, but virus isolates typically replicate to high titers and causes life threatening gastroenteritis in specific host species. In heterologous hosts, viral replication is restricted, spread is inefficient, and disease is asymptomatic. The host tropism of rotaviruses is likely determined by species-specific interactions between viral and host cell proteins, but this interaction is still not well understood. During infection, rotaviruses prevent induction of innate immune response via the activity of nonstructural protein 1 (NSP1), which target host proteins for degradation. However, the molecular basis of how NSP1 protein suppresses the innate immune response and whether this dictates host restriction is not well defined. Herein, we used congenic recombinant rotaviruses to test requirements for viral NSP1 protein during infection. We report that reassortant rotaviruses have either permissive or restricted phenotypes based on strain specific NSP1 protein. We report defects in viral replication and transcription due to host restriction. Furthermore, infection with restricted rotavirus recombinants induced innate immune signaling.

Presenter: Zakaria Abd Elmageed, PhD  
Co-Authors: Dalal Dawud; Kasia Michalak, MS; Adam Morrow, PhD  

*VCOM Student

Repurposing Chlorpromazine as a Potential Therapeutic Agent in Metastatic Castration-Resistant Prostate Cancer Cells: Investigating its Synergistic Effect with Anti-androgen Therapy

Background: Prostate cancer (PCa) remains a significant health concern at advanced stages, driving the exploration of innovative treatment strategies. Chlorpromazine (CPZ) is the first-generation antipsychotic drug that has been used to treat schizophrenia and other mental disorders. Recent studies have shown that CPZ may also have anti-cancer properties. Therefore, this study aimed to repurposing CPZ as a potential therapeutic candidate for metastatic castration-resistant PCa (mCRPC) management, with a specific emphasis on its synergistic effect with enzalutamide.

Methods: To study the effect of individual or combined drugs on CRPC cells, cell proliferation, scratch, and colony formation assays were performed. The in vivo model was established using luciferase tagged CRPC cells. These cells were subcutaneously injected into nude mice. The tumor growth and progression were monitored using IVIS bioluminescence imaging, a powerful tool to visualize and quantify the tumor burden over the course of the study.

Results: In vitro results consistently demonstrated a significant reduction in cell viability, migration, and colony formation when CPZ was used alone and in combination with enzalutamide, indicating a robust synergistic effect. Surprisingly, the in vivo results showed a potential reduction in tumor size and progression rate with CPZ monotherapy. However, the synergistic effect observed in vitro was not replicated in the mouse-model.

Conclusion: These findings highlight the importance of bridging the gap between the in vitro and in vivo results in drug development. The study demonstrates the potential of CPZ as a monotherapy for PCa based on preclinical observations. However, the benefit with combining CPZ with enzalutamide in the in vivo model suggests the need for further research to elucidate the complex interactions between these treatments and the tumor microenvironment, ultimately refining treatment strategies for PCa management.
Effectively Engaging the Latinx Community in Research: A Systematic Review

Presenter: Mayra Rodriguez, PhD
Co-Authors: Sarah Watts*, Allison Ebalo*

Although health care professionals recognize health disparities and value the evidence it brings, we have yet to significantly make any substantial progress on the issue. There is a disconnect in the way researchers engage Latinx communities and the health outcomes that are achieved. With a growing minority demographic and increasing rates of poor health outcomes, we are in need of an innovative approach to address the health disparities of the Latinx population. The goal of this project is 1.) identify barriers to recruiting and engaging minorities into research, 2.) identify recent recruitment practices; 3.) identify the existing gaps in research dissemination; 4.) discuss an innovative approach to engaging Latinx populations in research.

To answer these questions, we gathered the literature for a systematic review that asked, how researchers can effectively engage vulnerable Latinx populations in research? Although there are creative practices for recruiting community participants into research, there is little evidence on how Latinx populations are engaged to participate in research. Of the literature noted, we identified several common practices for recruitment which include, health fairs, primary and acute care settings, grocery stores, restaurants, faith-bath organizations, door-to-door, and community events. Additionally, several studies noted improved engagement when incorporating a community advisory council or board to guide their study and intervention development, recruitment, and implementation of the intervention. However, we also found that there is limited information on the challenges when recruiting minorities into studies. There is also limited assessment on the level of engagement in the community.

Thus, having a tailored research focus for a Latinx population is essential to improve health outcomes, yet establishing practices to engage and recruit this population for studies is important. There is a need for a framework that connects engagement and health outcomes.

Correlations between Methyldopa administration and norepinephrine levels in 14 outpatient psychiatric patients: A retrospective chart review.

Presenter: JuliSu DiMucci-Ward, PhD
Co-Authors: Paul Switzer, MD; Christopher Goddard*; Andrew Walker*, et al.

Overactive sympathetic nervous system activity may underlie many psychiatric conditions (e.g., excess catecholamines are suspected to underlie mania) and therefore should be considered when approaching treatment options. Methyldopa, a centrally acting α2 agonist which decreases production of the neurotransmitters used by the sympathetic nervous system, became an experimental treatment of interest for these psychiatric conditions. On the other side of the metabolic pathway, failure to break down catecholamines effectively can lead to an excess of catecholamines. One possible cause for excess catecholamines are mutations in the genes that code for enzymes involved in their catabolism. This retrospective chart review analyzed 14 patients at an outpatient psychiatric practice who received methyldopa as treatment for hypernorepinephrinemia to determine if significant correlations existed between methyldopa administration and changing catecholamine labs in these patients. Out of 14 patients, 1 patient experienced a statistically significant negative correlation between methyldopa administration and catecholamine levels. The remaining 13 patients either experienced no significant change (n = 12) or a statistically significant positive correlation (n = 1). As a possible explanation for the failure of methyldopa to effectively lower norepinephrine levels, we investigated the genomic profile of 9 patients within this cohort whose norepinephrine trend line over time had non-negative slope. Specifically, we looked for SNPs in MAO and COMT, two of the major genes involved in the metabolic breakdown of norepinephrine. We compared allele frequencies of 34 different SNPs within this population of 9 patients to that of the general population (via the gnomAD database) and found 4 SNPs of potential interest for further research: rs933271 (p = 0.040), rs737866 (p = 0.065), rs174699 (p = 2.99e-9), rs10521432 (p = 0.0090). These results indicate that careful consideration should be applied to alternative treatment approaches to psychiatric conditions associated with hypernorepinephrinemia such as methyldopa.

Effectively Engaging the Latinx Community in Research: A Systematic Review

Presenter: Mayra Rodriguez, PhD
Co-Authors: Sarah Watts*, Allison Ebalo*

Effectively Engaging the Latinx Community in Research: A Systematic Review

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Thus, having a tailored research focus for a Latinx population is essential to improve health outcomes, yet establishing practices to engage and recruit this population for studies is important. There is a need for a framework that connects engagement and health outcomes.
Autonomic Recalibration through Manipulative Treatment: A Novel Approach in Alleviating Chronic Myofascial Pain

Introduction: Myofascial pain exacerbates opioid misuse and opioid use disorder, making non-drug therapies like osteopathic manipulative treatment crucial research areas. A new approach involves utilizing the autonomic nervous system (ANS) via Autonomic Recalibration (AR), a force-based method aligning with osteopathic principles to address myofascial pain's neurobiological aspects.

Methods: A two-day study involved twenty adults with persistent neck or upper back myofascial pain. Measured outcomes included pain scale ratings, nociceptive points, autonomic indicators (GSR/HRV), muscle stiffness (ultrasound elastography), and mobility (assessed using motion capture data for functional anatomy analysis).

Results: Pain ratings decreased pre (M±SD: 3.8±2.24) to post (0.40±1.18) (p<.0001) with 85% of subjects reporting no pain post treatment. Nociceptive points were significantly reduced on both days with the following number of positive points on average: initial assessment (13.1), re-assessment (4.7), final assessment (0) on Day 1 and initial assessment (6.5), re-assessment (3.4), final assessment (0) on Day 2, X^2,p<.0001. Repeated measures t-test of GSR/HRV comparing nociceptive palpation exams on Day 1 and Day 2 (n=10) indicated a significant reduction in GSR (p=.04, Cohen's d=.55) and an increase in HRV (p=.04, Cohen's d=.82). Ultrasound elastography results showed that levator scapulae stiffness was reduced from pre-treatment (M±SD: 46.2±23.6) to post (36.7±18.8) (p<.0001, Cohen's d=.43), whereas there was no change of muscle stiffness of brachioradialis as a control pre (37.1±8.6) to post (36.3±8.0)(p=.26). Finally, motion capture suits provided coordinates of mobility pre- and post-treatment. Multivariate morphometric analysis indicated that AR impacted anatomy train posture and mobility (D= 22.79, p < .0001)

Conclusion: The data reflects pain reduction, diminished sympathetic dominance, and muscle stiffness decrease, alongside improved mobility. Yet, the association between these results and neurophysiological changes remains unclear. Future studies will explore neuroplastic alterations in neural networks related to the ANS and pain through neuroimaging.

Are the Zung scales for Anxiety and Depression still valid in 2023?

The Zung Self-Rating Anxiety Scale (SAS) and Zung Self-Rating Depression Scale (SDS) were developed by Dr. William Zung in the early 60s and 70s to assess the level of anxiety and depression in patients. These 2 scales have withstood the test of time being used in clinical practice, but it is of value to assess if the validity of these scales have held up to the standard of being used in a clinical setting. However, a natural question is whether the distribution of Zung's sample population has shifted in the past 50 years. This is especially relevant in the era where psychiatric diagnoses are billed using ICD10 diagnoses. In this retrospective chart review, we analyzed 51 patients at an outpatient psychiatric clinic that received an ICD10 billing code for a psychiatric disorder and whose chart contained either a Zung Anxiety or Zung Depression test. The mean Zung Depression (raw) score for those diagnosed with a depressive disorder (n = 29) was 48.931 (adjusted index score = 60) with standard deviation 8.8354, so that a substantial part of the distribution lies roughly in the moderate or marked depression range. The mean Zung Anxiety (raw) score for those diagnosed with an anxiety disorder (n = 21) was 42.9524 (adjusted index score = 54) with standard deviation 6.6079, which places a large portion of the distribution in the minimal-to-moderate anxiety range. These preliminary results suggest that the Zung Depression and Zung Anxiety scales still correlate well with the modern understanding of these psychiatric disorders (depression and anxiety) established by ICD10 diagnoses.
Mechanisms of genome protection at noncanonical DNA structures.

DNA in all organisms is double-stranded; however, single-stranded DNA is formed during various processes including DNA replication and repair. Some of these single-stranded DNAs can form noncanonical structures. Noncanonical DNA structures can affect DNA replication, transcription and DNA repair causing genome instability, which can lead to genetic diseases including cancer. Proteins can bind nonspecifically, site-specifically and/or structure-specifically to single-stranded DNAs or their noncanonical structures to regulate various DNA transactions. Our current work is on such DNA structures and proteins binding to them.

Because of the transient nature of single-stranded DNAs in the cell, in vivo techniques may not reveal all such sequences, the noncanonical structures or proteins bound to them. To explore all such potential protein-binding sequences and structures genome-wide, it is necessary to conduct in vitro analysis, and this warrants generation of single-stranded DNA libraries in vitro. Current in vitro methods involve heat denaturation of libraries of double-stranded DNA fragments followed by cooling to prevent reannealing; however, a significant amount of DNA can reanneal and regenerate double-stranded DNA. We have developed a novel enzymatic method – ExoChew – to convert double-stranded DNA fragment libraries to single-stranded DNA libraries. Genomic DNA is first sonicated to generate pools of double-stranded DNA fragments of required size. The pool of double-stranded DNA fragments is treated with either T7 exonuclease or E. coli exonuclease III that recognizes double-stranded DNA ends and cleaves from either 5' ends or 3' ends generating single-stranded DNA pools respectively. Using ExoChew we are now conducting inhouse genome-wide studies of protein-DNA interactions and noncanonical DNA structures namely G-quadruplexes (G4s) and intercalating motifs (iMs).

Recently, we have procured a circular dichroism (CD) spectroscope. Using CD, we are studying specific protein-iM and protein-G4 interactions.

The Impact of an Automated and Personalized Email-Based Intervention, With or Without Coaching, on Health-Related Behavior Engagement

There is often a gap between aspirational intentions and behavior implementation. Many individuals intend to eat healthier, be more physically active, spend less time on their phone, and get more sleep. These are aspirations and, in order to be realized, specific behaviors must be implemented. Implementation intentions — plans specifying when and/or where behaviors will be performed — have been shown to increase behavior engagement across multiple domains. Coaching, which provides support and accountability, has also been shown to increase behavior engagement. Many target behaviors can be developed into habits — behaviors that are prompted somewhat automatically. Research shows that behaviors that are more intrinsically or immediately rewarding are more readily developed into habits. Two randomized controlled studies employing these insights have been conducted. One aimed to help motivated individuals decrease their phone screen time use, and the other aimed to help motivated individuals start a weekday outdoor walking (WOW) routine. The primary outcomes were change in phone screen time use and average daily step count, respectively, from baseline to four-week follow-up, as assessed via screenshots of participant phone data. Both studies included a Control group, an automated intervention group (No-Coach), and an intervention group with the opportunity for email-based coaching (Coached). All intervention groups completed an online activity in which they created implementation intentions and identified immediate behavior rewards on which to focus. They also received a two-week-long personalized email campaign. In the phone screen time study, the mean (±SD) daily phone screen time use increased 14.9 (±78.2) minutes in the Control group (N=29) and decreased 42.0 (±94.2) minutes in the No-Coach group (N=17; p=0.05). Four-week follow-up data are currently being collected for the WOW study and will be presented on the poster, along with additional findings, discussion, and conclusions.
Presenter: Clay Pandorf, PhD
Co-Authors: Valentyna Williams*, Rajesh H. Amin, Merrilee Holland

A role for long non-coding RNA in regulating the slow/beta myosin in cardiac muscle in response to compensatory cardiac hypertrophy

Compensatory hypertrophy occurs during initial stages of hypertension and subsequently progresses to heart failure. This results in an increase of slow/beta myosin heavy chain (β-MHC) that is mediated by the transcriptional activation of the MYH7 gene. We previously discovered several long non-coding (Inc) RNAs by RACE PCR and sequencing that are transcribed from the antisense (AS) strand of the MYH7 gene, thus named MYH7-AS. These IncRNAs appear to have distinct transcription start sites downstream from MHRT, another MYH7-associated IncRNA previously shown to protect the heart from hypertrophy and failure. MYH7-AS partially overlaps the microRNA (miR) 208b, which is encoded in a MYH7 intron.

Objective: test the hypothesis that MYH7-AS levels are decreased by aortic banding, in association with β-MHC upregulation, thereby implicating its role in regulating cardiac MYH7 that occurs as a compensatory response to pressure and volume overload.

Methods: We induced cardiac hypertrophy in rats with the pressure overload surgical procedure of ascending aortic banding (AAB) for 16 days and compared this to a sham surgery group (N=6). RNA expression was examined by real-time PCR.

Results: Cardiac mass (heart weight/body weight ratio) was increased by 29% in response to AAB. M-mode echocardiographic parameters of cardiac left ventricle at the time of sacrifice such as interventricular septal thickness (+24%) and left ventricular free wall thickness (+32%) were similarly increased. Other mRNA markers of cardiac hypertrophy (ANP, BNP, α-MHC) were also responsive to AAB. These data indicate that the AAB effectively induced cardiac hypertrophy at the acute stage of cardiac failure. MYH7 mRNA was significantly increased in left ventricle after AAB as compared to sham (2.1-fold), and there was a corresponding 4.2-fold less expression of MYH7-AS with AAB.

Conclusions: Further research will be needed to determine if MYH7-AS could be utilized as a therapeutic approach to protect the heart from failure.

Presenter: Steven Enkemann, PhD
Co-Authors: Joshua Ranta*, Andrew Walker*, JuliSu DiMucci-Ward, PhD

Are Physicians Capturing Enough Data to Make Infant Growth Charts Useful Diagnostic Tools?

Background: Growth monitoring is considered a fundamental component of routine pediatric care. Tracking the anthropometric measures of height, weight, and head circumference can be used to detect malnutrition, genetic and endocrine disorders, and even viral diseases. In the era of electronic health monitoring, what once was done with pencil and paper is now digital. The fundamental question is whether it is better.

Objective: This project was initiated to determine whether enough data was collected from infants to allow physicians to plot growth curves. Current pediatric recommendations indicate that a newborn infant should be measured at or shortly after birth, at 0.5, 2, 4, 6, and 9 months of life in the first year and 4 more times in the second year of life. We investigated the electronic health data of more than 9000 individuals to determine if this objective was being met for infants in South Carolina.

Results: Infants in South Carolina were measured an average of 7 times in two years. Approximately half of all infants missed a measurement within the first two months of life and never record a later measurement. This trend continues with additional missed visits in the first two years. If only well visits were considered, more than half of all infants had missed 2 measurements within the first 6 months of life and averaged only 5 well check visits in two years.

Conclusions: Anthropometric measurements are insufficient for detecting problems using growth curves.
**Presenter: Mohammad Faisal Hossain, PhD**  
**Co-Authors: Kenna Fields, PharmD; Machaela Keene, PharmD; Md. Mazharul Islam Chowdhury, PhD; Randy Mullins, PharmD**

**A novel and simplified compounding Approach: Steps to be taken to correctly compound slow-release capsules**

While extended-release dosage forms are an effective method to increase patient adherence and improve pharmacotherapy, predicaments still remain with formulation preparations when it comes to pharmaceutical compounding. Compounded hormone preparations are often prescribed by physicians in the United States. The compounded preparations may be called Slow Release (SR) capsules, but the exact release kinetics and the quality of the preparation may not be fully known. Formulation development for SR capsule dosage forms requires proper knowledge and training of the compounder and an appropriate facility. In the current 503A pharmacy setting, Traditional compounding pharmacy, it is not practical to conduct research to develop the SR formulations. Alterations in various excipients as well as their ratio may alter the efficacy and can lead to inconsistent formulations. SR capsules generally allow higher drug concentration compared to a conventional unit dose. If the formulation is not compounded correctly, it may pose a significant risk of toxicity as a result of dose dumping. To address these issues, different strengths of drug excipient blends for SR preparations could be premade, tested, and distributed by a 503B compounding pharmacy (an outsourcing facility) to 503A pharmacies to compound SR capsules/tablets using a simple allegation method. This approach will ensure appropriate dosing from prescribers, adequate release profiles, and quality for sufficient efficacy and patient safety. To test this novel concept, we formulated different strengths of drug excipient mixtures for thiamine HCl SR preparations using 30—40% Methocel E4M, Methocel K100M, and lactose by both dry mix and wet granulation methods. To characterize the formulations, we have developed a high-performance liquid chromatography (HPLC) method. We are evaluating the release kinetics in phosphate buffer at pH 6.8 using the USP dissolution apparatus and HPLC.

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**Presenter: Ramu Anandakrishnan, PhD**  
**Co-Authors: Ryan Shahidi*, Andrew Dai*, Veneeth Antony*, Ian J Zyvoloski**

**Blood-based genomic screening panel for lung cancer based on clonal hematopoietic mutations**

**Background:** Early detection can significantly reduce mortality due to lung cancer. However, financial, and other barriers for the currently approved screening protocol (low dose computed tomography (CT) scan) have limited its uptake. Presented here is a blood-based screening panel based on clonal hematopoietic mutations. Mutations in tumor cells that inhibit immune destruction have been extensively studied. However, mutations in immune cells that may prevent an effective anti-tumor immune response remain relatively unstudied. Animal model studies suggest that clonal hematopoietic (CH) mutations in tumor infiltrating immune (TII) cells can modulate cancer progression, representing potential predictive biomarkers. The goal of this study was to determine if the clonal expansion of these mutations in blood samples could predict the occurrence of lung cancer.

**Methods:** A set of 98 potentially pathogenic CH mutations in TII cells were identified using sequencing data from lung cancer samples. These mutations were used as predictors to develop a logistic regression machine learning model. The model was tested on a set of 578 lung cancer and 545 non-cancer samples from 18 independent cohorts.

**Results:** The logistic regression model correctly classified lung cancer and non-cancer blood samples with 94.12% sensitivity (95% Confidence Interval: 92.20-96.04%) and 85.96% specificity (95% Confidence Interval: 82.98–88.95%). In addition, the model correctly classified 89.98% of lung cancer and 74.86% of non-cancer blood samples with high confidence (prediction probabilities of > 0.9 and < 0.1 for cancer, respectively).

**Conclusions:** Our results suggest that it may be possible to develop an accurate blood-based lung cancer screening panel. Unlike most other “liquid biopsies” currently under development, the assay presented here is based on standard sequencing protocols and uses a relatively small number of rationally selected mutations as predictors.

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**Presenter: Mohammad Faisal Hossain, PhD**  
**Co-Authors: Kenna Fields, PharmD; Machaela Keene, PharmD; Md. Mazharul Islam Chowdhury, PhD; Randy Mullins, PharmD**

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**Wearable Simulation Devices are Safe in Use for Medical Training**

Presenter: Jeff Adams, MS
Co-Authors: David Kashmer, MD; Katie Dinsmoore, Ana Jones, Jacob Adams NRP, Heath Parker, DO

Wearable simulation devices (WSDs) are increasingly being utilized in medical education and training to provide immersive, hands-on learning experiences for students. However, learner and educator safety must be carefully evaluated and considered with the introduction of any new training modality or technology. This study surveyed members of the Society for Simulation in Healthcare regarding their experience and issues encountered when using WSDs for simulation-based training.

Fifty-two participants who use the simulation for medical education completed the survey assessing problems and adverse events associated with using WSDs. Approximately 27% of respondents reported having encountered an issue or problem when using WSDs with learners. In contrast, 38% reported never experiencing any issues with the use of these wearable devices for simulation training.

For those respondents who reported problems with WSDs, device fit, and size was the most commonly cited challenge (80% of problems). The WSD not fitting the learner properly could negatively impact the training experience. The second most common issue was difficulties understanding how to correctly use and operate the WSD (60%), highlighting the importance of proper training for both learners and educators on appropriate device utilization.

Notably, the estimated probability of a needlestick or puncture injury associated with WSD use was just 0.9% over a participant's entire career. This low rate suggests the risk of such injuries during any individual simulation training event using these devices is much smaller. Thus, the use of WSDs does not appear to increase safety risks for learners or educators versus traditional simulation methods.

Additional problems cited by respondents included high costs, difficulties maintaining the devices, low fidelity of some devices limiting training value, and general dislike of the training experience. Moving forward, the design and implementation of WSDs should focus on improving fit, ease of use, fidelity to real procedures, and reducing costs.

**Cranial Osteopathic Manipulation Alters Alzheimer’s Disease Phenotype in Wild Type and Transgenic Rats**

Presenter: Blaise Costa, PhD
Co-Authors: De’Yana Hines, Hope Tobey, DO; Ramu Anandakrishnan, PhD; Pamela Vandevord, PhD, et al.

As humans age, fluid circulation decreases in the brain, causing a build-up of macromolecules leading to neuroinflammation which has been linked to Alzheimer's Disease (AD) development (Iliff et al., 2013). CNS lymphatic vessels clear this metabolic waste, including amyloid beta (Aβ), which is associated with AD (Louveau et al., 2015). Cranial Osteopathic Manipulation (COM) is a novel noninvasive treatment that could help alleviate this issue since there is a lack of practical physiological or pharmacological mechanisms to increase fluid circulation. Based on our pilot study, immunoassay analysis and positron emission tomography (PET) showed that COM reduced Aβ levels, activated astrocytes, and improved excitatory neurotransmission in aged rats. This study planned to confirm these findings using Fischer-344 transgenic rats (Tg) and 3-month-old wild type (WT) rats of both sex split into COM and untreated control groups. COM was performed for 7-days with the osteopath wearing FingerTPS's nano-sensor gloves to quantify the pressure applied to the occipital squama. Spatial learning and memory were assessed using Morris Water Maze (MWM) and Novel Object Recognition (NOR). The Holm-Šídák multiple comparison T-Test showed significant differences in 7 MWM parameters for Tg and 9 for WT on day-5 (platform hidden), including Shortest Visit to the NW-Zone. The same analysis was used for NOR. COM treated animals spent numerically more time exploring the novel object. To identify differentially expressed genes associated with AD, a proteome analysis was performed on Tg hippocampal tissue. The analysis identified that COM significantly increased the expression of serine-threonine-kinase P21-activated-kinase-3 (PAK3), and fifty other proteins. These findings indicated that COM improved cognitive function as it induced improvement in spatial learning and memory parameters for Tg and WT rats. Further studies with larger sample sizes are underway to validate current findings. Therefore, results favor clinical use of COM as a non-invasive, non-pharmacological treatment for AD.
**Abstracts**

**Evaluation of Vaginal Microbiome to Estimate Vaginal Health in Gynecology Patients Presenting with Vaginitis**

Presenter: Lisa Carroll, MD  
Co-Authors: Sydney Achee, DO, Nicolette Adderton*, James Mahaney, PhD; et al.

Context: Approximately 50% of symptomatic and asymptomatic vaginitis is misdiagnosed in the clinical setting. However, the use of artificial intelligence (AI) has the potential to improve accuracy and prompt treatment.

Objective: Determine if the AI assisted Caza Health nCyteTM antibody fluorescent enhanced scanning microscopy can provide more accurate diagnosis of vaginitis compared to current standards.

Methods: Our goal was to test 400 women with symptomatic vaginitis and 100 asymptomatic controls collected in three residency clinics. Subjects were older than 18 and reported abnormal discharge, itching, and/or discomfort. Exclusion criteria included lack of informed consent, use of oral antibiotics in the past 14 days, use of vaginal products or lubricant, vaginal intercourse in the last 24 hours. Vaginal swab samples were collected from each subject. The vaginal swabs were used to prepare a wet mount microscopy slide and an immunofluorescence assay (IF) slide for direct comparison using artificial intelligence (AI) to identify the presence of clue cells, yeast pseudo-hyphae and trichomonads.

Results: In the preliminary data for 118 patient samples, the AI + Amsel Criteria as compared to physician health assessment had an overall accuracy of 83% for bacterial vaginosis (BV), 75% for candidal vaginitis (CV) and 78% for trichomoniasis (TV). After additional training of the algorithms the accuracy for BV was increased to 86%, CV to 83% and TV to 94%. Discordant analysis of samples by staining the wet mount microscope slide and comparing it to the results found on the IF slide, demonstrated that in 79% of the cases for BV the wet mount result was inaccurate; in 66% of CV samples and 64% of TV samples the IF slides were accurate.

Conclusion: Based on preliminary data, the AI + Amsel criteria has shown superior ability to diagnose common vaginal infections as compared to standard wet mount.

**3D Additive Manufacturing Provides Equipment for Underserved Areas in the US and Central America**

Presenter: Ana Jones  
Co-Authors: Jacob Aron, Anapaula Bergland, Angela Burns, David Kashmer MD; et al.

The unique VCOM experience with clinics in rural Latin America prompted exploration of unique and innovative ways to expand access to useful medical tools for patient care. An OVID and Google Scholar literature search (using search terms including “additive manufacturing”, “3D design”, and “underserved populations”) reveals important, but few, articles regarding the creation of useful medical equipment using additive manufacturing (3D printing). In this narrow venue, there is little discussion about the need for basic, medical-grade, low-cost implements. The VCOM experience and our literature review demonstrate the need for mass production of low-cost devices for developing countries and areas without easy access to standard medical implements such as reflex hammers.

In the interest of addressing the need for medical equipment in underserved communities, the Simulation and Technology Center and International Outreach department at VCOM-Auburn has worked with students and interns to develop low-cost, effective medical equipment such as reflex hammers and stethoscopes for use in rural areas. In doing so, the mission of VCOM “to meet the needs of rural and medically underserved populations” is to be promoted.


MEET OUR TEAM

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The Research Department serves to foster VCOM’s research mission by providing services to VCOM faculty, staff and affiliated academic partners in research administration, grant and contract stewardship, research compliance oversight and intellectual property management. Most importantly, the Research Department facilitates the ability of VCOM’s faculty, staff and students to engage in research, innovation and scholarship.
Thank you to our faculty and collaborators who shared their knowledge and insight as session speakers, panelists, and the Research Retreat Planning Committee!
A Taste of
The Loveliest Village
On the Plains

Amsterdam Café $$ - 0.5 mi

Hamilton’s (Fine, American) $$ - 0.4 mi

Toomer’s Drugs (Famous lemonade) $ - 0.3 mi

Bow & Arrow (BBQ) $$ - 3.0 mi

Ariccia Cucina Italiana $$ - In AU Hotel

The Hound (Fine, Southern) $$ - 0.4 mi

Hey Day Market (Food Hall) $ - $$ - Next to AU Hotel

Moe’s Original BBQ $ - 0.3 mi

Acre (Fine, Southern) $$$ - 0.6 mi

Mellow Mushroom (Pizza) $ - 0.4 mi

Momma Goldberg’s Deli $ - 0.8 mi

The Depot (Fine, Seafood) $$$ - 0.6 mi

Jack Brown’s Burger Joint $ - 0.4 mi

Live Oaks (American) $$ - 0.5 mi

Esposito’s Italian Bistro $$ - 0.4 mi

*All distances measured from Auburn University Hotel & Conference Center*
Start across the street from the Auburn Hotel on the sidewalk in front of the Ralph Brown Draughon Library.

End in front of the library.

Turn left at Toomer's Corner onto W. Magnolia Ave.

Cross the street and backtrack a little bit to go down through the Memorial Garden.

Be cautious here because there is no sidewalk.

Turn left onto W. Samford Ave.

Turn left onto S. Donahue Dr.

This wide sidewalk is called Thach Concourse.

Please contact Dr. Brock with any questions.