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5th Annual CNU RESEARCH SYMPOSIUM

January 29, 2021

Program & Abstracts

The 5th Annual CNU Research Symposium

January 29, 2021 8:00 AM – 5:00 PM

Oral Presentations (Teams Link)

Time	Duration (minutes)	Agenda
8:00 AM - 8:45 AM	45	**Registration**
8:46 AM - 9:00 AM	15	**Opening Remarks** **Dr. Alvin Cheung, PharmD, MHSA, CNU President**
9:01 AM - 9:45 AM	**45**	**Keynote Speaker** **Dr. Mohsan Saeed, Ph.D., Assistant Professor, Biochemistry, Boston University School of Medicine** *Immune Evasion Tactics of SARS-Cov-2* *Introduction: Dr. Ahmed Elshamy*
9:46 AM - 10:05 AM	20	**Luling Li (P3 Student), CNUCOP** *Role of Thioredoxin-interacting Protein (TXNIP) in Mediating the Interaction between Obesity and Sterile Inflammation*
10:06 AM - 10:25 AM	20	**Hannah Neiger, Emily L. Siegler, Sylvia Dinh (M2 Students), CNUCOM** *Identification of Synthetic Lethal Partners of Cancer Predisposition Genes*
10:26 AM - 10:45 AM	20	**Anand Singh and Ishaq Aslam (CHS Students), CNUCHS** *Investigating the Role of Microhomologies in Double-Strand DNA Break Repair*
10:46 AM - 12:15 PM	**90**	**Poster Presentation - LUNCH & Break**
12:16 PM - 1:00 PM	**45**	**Keynote Speaker** **Dr. Fakhrul Ahsan, Distinguished Professor, Pharmaceutical and Biomedical Sciences, CNUCOP** *Novel Drug Delivery and Microfluidic Systems for Better Therapy, Diagnosis and Understanding of PAH* *Introduction: Dr. Xiaodong Feng*
1:01pm-1:20pm	20	**Dr. Andrea Schneider, Associate Professor, CNUPSY** *Women with Fragile X-associated Tremor/Ataxia Syndrome*
1:21 PM - 1:40 PM	20	**Victor Changcoco (P3 Student), CNUCOP** *The Role of C4a on ERK and Akt Activation in High Glucose-cultured Human Umbilical Venous Smooth Muscle Cells (UVSMCs)*
1:41 PM-2:00 PM	20	**Mary Jabari (MPS Student), CNUMPS** *Various Point-mutations in the CCR5 Gene Cause Decrease in Its Activity as Co-receptor in HIV Infection*
2:01 PM – 2:10 PM	**10**	**Break**
2:11 PM – 2:30 PM	20	**Dr. Jill Dahlman, Assistant Professor, CNUCHS** *Explosive and Engaging: Working with National Parks for Authentic Assignments and Student Engagement*
2:31 PM - 2:50 PM	20	**Dr. Tammy Lee (PGY1 Resident), CNUCOP** *The Impact of Empiric Antibiotics Use in COVID-19 Patients: A Retrospective Cohort Study*
2:51 PM - 3:10 PM	20	**Arpine Agakhanyan (CoPSY Student), CNUPSY** *Effects of Physical Activity on The Mechanisms of Sleep*
3:11 PM - 3:30 PM	20	**David Lindars, Ara Alexanian, Kate Wigginton and James Ziegenbein (M2 Students), CNUCOM** *Medical Student Anxiety Levels and Help-Seeking Behavior*
3:31pm-3:50pm	20	**Dr. Eslam Mohamed, Assistant Professor, CNUMPS** *Targeting ER stress as a promising strategy to reprogram immunosuppressive myelopoiesis in the tumor microenvironment*
3:51 PM – 4:00 PM	**10**	**Break**
4:01 PM - 5:00 PM	60	Award Ceremony
5:01 PM		Adjournment

Poster Tracks & Presentations

Track 1 - Basic Research/Cancer/Natural Products (Track 1 Teams Link)

Poster #	Abstract Title	Start Time	End Time
1	Sirtuin-3 Pharmacologically Promotes Insulin Sensitivity Through PI3/AKT and its Downstream Pathway in Adipocytes	10:45:00 AM	10:50:00 AM
2	Investigating the Role of Microhomologies in Double-Strand DNA Break Repair	10:50:00 AM	10:55:00 AM
3	Sumac Induces Mitochondrial Stress and Toxicity in KRAS-dependent Pancreatic Cancer Cells	10:55:00 AM	11:00:00 AM
4	Identification of Synthetic Lethal Partners of Cancer Predisposition Genes	11:00:00 AM	11:05:00 AM
5	RELT family member-induced apoptosis: elucidation of pathway and relevance to breast cancer.	11:05:00 AM	11:10:00 AM
6	Gallstone Diseases: An Overview and Herbal Treatment	11:10:00 AM	11:15:00 AM
7	Complement Activation Fragment C4a/C4adesArg Activates Akt through PAR1/4 in Human Endothelial Cells	11:15:00 AM	11:20:00 AM
8	Extending the σ-Hole Motif for Sequence-Specific Recognition of the DNA Minor Groove	11:20:00 AM	11:25:00 AM
9	Modulation of Molecular Targets of Non-Alcoholic Fatty Liver Disease with Natural Plant Extracts in Hepg2/C3A Cells	11:25:00 AM	11:30:00 AM
10	Quantification of Intracellular Lipids in 3T3-L1 Adipocytes Using Image Analysis Software	11:30:00 AM	11:35:00 AM
11	The Role of C4a on ERK and Akt Activation in High Glucose-cultured Human Umbilical Venous Smooth Muscle Cells (UVSMCs)	11:35:00 AM	11:40:00 AM
12	Activation of COX2/PGE2 Pathway is not Involved in Dedifferentiation of Cardiac Myofibroblasts Induced by Phorbol 12-myristate 13-acetate	11:40:00 AM	11:45:00 AM
13	Role of TXNIP in development of High Fat Diet-induced inflammation & early markers for Alzheimer's Disease	11:45:00 AM	11:50:00 AM

Track 2 - Infectious Diseases & COVID-19 (Track 2 Teams Link)

Poster #	Abstract Title	Start Time	End Time
1	Initiating Pediatric Antimicrobial Stewardship Program Pilot in a Community Hospital	10:45:00 AM	10:50:00 AM
2	Early Antibiotic De-escalation in Patients with Febrile Neutropenia	10:50:00 AM	10:55:00 AM
3	Analysis of Pharmacy Protocol in the Evaluation of MRSA PCR in De-escalation of Vancomycin for Empiric Bacteremia	10:55:00 AM	11:00:00 AM
4	Ability of Pseudomonas Aeruginosa to Modulate the Anti-Staphyloccocal Pharmacodynamics of Linezolid	11:00:00 AM	11:05:00 AM
5	The Impact of Empiric Antibiotics Use in COVID-19 Patients: A Retrospective Cohort Study	11:05:00 AM	11:10:00 AM
6	Various Point-mutations in the CCR5 Gene Cause Decrease in Its Activity as Co-receptor in HIV Infection.	11:10:00 AM	11:15:00 AM
7	A Pseudo-Understanding of Chronic Wound Infections	11:15:00 AM	11:20:00 AM
8	COVID-19 Vaccine: What We Know and What We Need to Know as Caregivers	11:20:00 AM	11:25:00 AM
9	Exploring the Reactions of the Community on Using Hydroxychloroquine for COVID-19 Treatment: A Perspective from Social Network Users	11:25:00 AM	11:30:00 AM

Track 3 - Clinical Practice, Management, Simulation, and Well-being (Track 3 Teams Link)

Poster #	Abstract Title	Start Time	End Time
1	Comparing Intubation Airway Barrier Devices Using a Simulated Airway Task Trainer	10:45:00 AM	10:50:00 AM
2	Prevalence and Comparison of Potentially Inappropriate Medication Use in Elderly Over An 8-Year Period	10:50:00 AM	10:55:00 AM
3	Effects of Physical Activity on The Mechanisms of Sleep	10:55:00 AM	11:00:00 AM
4	The Application of Cognitive Flexibility Theory to Resolve the Inherent Ill-Structuredness of IPE	11:00:00 AM	11:05:00 AM
5	A First Report of HCTZ and Dicyclomine Induced Uncharacteristic Contraction Alkalosis	11:05:00 AM	11:10:00 AM
6	Intimate Partner Violence (IPV): What Are the Physiological and Psychological Consequences?	11:10:00 AM	11:15:00 AM
7	Are Relationships Good for Your Mental Health?	11:15:00 AM	11:20:00 AM
8	Comparing Efficacy of Intravenous Diazepam Versus Intravenous Lorazepam in Alcohol Withdrawal	11:20:00 AM	11:25:00 AM
9	The CNUCOP Management, Policy and Leadership (MPL) Program	11:25:00 AM	11:30:00 AM
10	Naloxone Furnishing Within Different Counties of California	11:30:00 AM	11:35:00 AM
11	Outcomes of Pharmacist-implemented Opioid Stewardship Program at AHWM	11:35:00 AM	11:40:00 AM
12	Is Dispositional Optimism Associated with Subjective Physical Health Across Demographics?	11:40:00 AM	11:45:00 AM

Track 4 - Educational Research and Informatics (Track 4 Teams Link)

Poster #	Abstract Title	Start Time	End Time
1	Mixed Method Evaluation of a Virtual Pandemic Interdisciplinary Pre-Matriculation Program	10:45:00 AM	10:50:00 AM
2	CNUCOP Certificate: Preparing Students for Experiential Training and Beyond the Didactic Curriculum	10:50:00 AM	10:55:00 AM
3	Medical Student Anxiety Levels and Help-Seeking Behavior	10:55:00 AM	11:00:00 AM
4	Comparison of 3-year and 4-year Pharm.D. Programs	11:00:00 AM	11:05:00 AM
5	Evaluation of Student Pharmacists' Ability to Measure Blood Pressure	11:05:00 AM	11:10:00 AM
6	Use of Concept Mapping to Identify Expectations of Pharmacy Students Selecting Elective Courses	11:10:00 AM	11:15:00 AM
7	Student Pharmacists Promoting Awareness and Engagement in Advocacy for the Profession	11:15:00 AM	11:20:00 AM
8	Support Vector Machine Model for Predicting Breast Cancer Risk	11:20:00 AM	11:25:00 AM
9	Gaps between Teaching and Practice in Pharmaceutical Compounding: Currents, Expectations, and Solutions	11:25:00 AM	11:30:00 AM
10	Student Live Online Proctoring Tutorial for Synchronous Online Exam Sessions Using Student's Two Exam Taker Devices	11:30:00 AM	11:35:00 AM

Keynote Speaker Biography

Dr. Fakhrul Ahsan: Dr. Fakhrul Ahsan is a Distinguished Professor in the Department of Pharmaceutical and Biomedical Sciences at the California Northstate University College of Pharmacy (CNUCOP), Elk Grove, CA. Before joining CNUCOP, Dr. Ahsan has been a University Distinguished Professor at Texas Tech University Health Sciences Center School of Pharmacy in Amarillo, Texas (TTUHSC SOP), wherein he served at the faculty for 19 years. A pharmacist by training, he earned his pharmacy degree from the University of Dhaka in Bangladesh. He received his Ph.D. in Pharmaceutics from Complutense University of Madrid, and his postdoctoral training from the University of Alabama at Birmingham. TTUHSC recognized his excellence as an educator and investigator by awarding him with the President's Young Investigator Award in 2004. Dr. Ahsan has also been the Program Advisor for the Graduate Program in Pharmaceutical Sciences at TTUHSC SOP for seven years. Dr. Ahsan's research revolves around the development of novel formulations for the pulmonary delivery of small- and large-molecular-weight therapeutic agents for the treatment of pulmonary hypertension. He has also been deploying microfluidic chips for understanding the PAH pathophysiology and developing diagnostic markers for PAH. His research also involves 3D printing for customized dosage forms for pediatric PAH patients. He is a member of the Editorial Boards of the European Journal of Pharmaceutical Sciences and the Journal of Pharmacy and Pharmaceutical Sciences, and was an Associate Editor of the Journal of Drug Targeting. Dr. Ahsan is an NIH-funded investigator: he has received three R15s, two R01 grants, and an R42 grant. He also serves at various NIH and DoD study sections.

Novel Drug Delivery and Microfluidic Systems for Better Therapy, Diagnosis and Understanding of PAH

Pulmonary arterial hypertension (PAH) is a rare disease in which pulmonary arteries/arterioles become stiffer and occluded. Thus, the heart must work harder to pump blood through the occluded arteries into the lungs. In so doing, the heart becomes enlarged and patients die of right heart failure. Currently, PAH is treated with various types of oral, injectable, and inhalable dosage forms. However, the current therapy is suboptimal in terms of patient compliance and adverse effects including taking a given dosage form multiple times a day and systemic hypotension. Further, the pathophysiology of the disease is poorly understood that involves aberrant proliferation, migration and displaced growth of pulmonary arterial cells (PACs), development of apoptosis-resistant endothelial cells (ECs), enhanced deposition of extracellular matrices (ECMs), thickening of smooth muscle layers, and acquisition of smooth muscle cell (SMC)-like phenotypes by ECs. Because the symptoms of the disease, especially in the early stages of the disease, is non-specific and subtle that include shortness of breath, fatigue, fainting, palpitations, and chest pain, which may signal for other conditions such as anxiety, obesity, asthma, and angina. Thus, PAH patients are often misdiagnosed, or diagnosis is delayed. Current standard diagnosis for PAH patients is right heart catheterization (RHC), a very invasive diagnostic that requires hospitalization. Further, one of the puzzling aspects of PAH is that it affects more women than men but women with PAH tend to live longer than men. Female patients are more responsive to one type of drugs and male patients to another. Importantly, pediatric patients are often treated with the dosage forms available for adults. As such, the goal of my research revolves around all facets of this rare disease that include (i) development of targeted therapy and formulations that enhance patient compliance and reduce side effects, (ii) utilization of microfluidic-based disease-on-a-chip model to elucidate biomolecular processes indicated in the genesis of the disease (iii) deployment of the microengineering technology to develop a non-invasive marker, circulating endothelial cells (CECs), for early diagnosis, therapeutic monitoring and evaluating the disease progression. Overall, my current research is focused on better understanding of the disease, development of patient-friendly customized therapy and validation of a point-of-care non-invasive diagnostic method.

Keynote Speaker Biography

Dr. Mohsan Saeed: Dr. Saeed is an Assistant Professor of Biochemistry at the Boston University School of Medicine and an Investigator at the National Emerging Infectious Diseases Laboratories of Boston University. His current research interest includes the study of the interface between viruses and the host antiviral innate immune system. In March 2020, when COVID-19 was declared a global pandemic, Dr. Saeed's group shifted its focus to SARS-CoV-2, the causative agent of COVID-19, and has since been studying the molecular details of how the virus subdues the human immune system and creates a favorable environment for its replication. Dr. Saeed received his M.Phil. degree in Microbiology from Quaid-e-Azam University, Pakistan, and a Ph.D. degree in Pathology, Immunology, and Microbiology from the University of Tokyo, Japan. Before joining Boston University, he did his postdoctoral training at the Rockefeller University in New York, where he worked with Dr. Charles M. Rice, a world-renowned virologist and one of the three recipients of the 2020 Nobel Prize in Physiology and Medicine for his extraordinary contributions to the field of HCV research. During this period, Dr. Saeed worked on HCV clinical isolates in the laboratory using the modern loss- and gain-of-function approaches, succeeded in developing a cell culture system that allowed direct propagation of HCV from the patient sera. Dr. Saeed also conducted extensive research on human viruses, including Zika virus, yellow fever virus, dengue virus, and enteroviruses. Recently, he has identified a set of new proteins in the human immune system, which are targeted by enteroviral proteases for cleavage.

Immune Evasion Tactics of SARS-CoV-2

SARS-CoV-2 can infect multiple organs, including lung, intestine, kidney, heart, liver, and brain. The molecular details of how the virus navigates through diverse cellular environments and establishes replication are poorly defined. We performed global proteomic analysis of the virus-host interface in a newly established panel of phenotypically diverse, SARS-CoV-2-infectable human cell lines representing different body organs. This revealed universal inhibition of interferon signaling across cell types following SARS-CoV-2 infection. We performed systematic analyses of the JAK-STAT pathway in a broad range of cellular systems, including immortalized cell lines and primary-like cardiomyocytes, and found that several pathway components were targeted by SARS-CoV-2 leading to cellular desensitization to interferon. These findings indicate that the suppression of interferon signaling is a mechanism widely used by SARS-CoV-2 in diverse tissues to evade antiviral innate immunity, and that targeting the viral mediators of immune evasion may help block virus replication in patients with COVID-19.

ORAL PRESENTATIONS

(In order of appearance)

Role of TXNIP in development of High Fat Diet-induced Inflammation & Early Markers for Alzheimer's Disease.

Authors:

Luling Li*, PharmD Candidate (presenter), College of Pharmacy, California Northstate University,

Hassan Al-Shiyab*, PharmD, Master of Pharmaceutical Sciences Program, California Northstate University

Azza B. El-Remessy, PhD, PharmD, Department of Surgery, 820 South Wood Street, University of Illinois at Chicago.

*Equal Contribution

Advisor:

Islam Mohamed, B. Pharm, MS, PhD Department of Pharmaceutical and Biomedical Sciences

California Northstate University College of Pharmacy.

Introduction: Obesity and Insulin resistance are established risk factors for Alzheimer Disease (AD). Several studies have shown upregulation of pro-inflammatory Toll Like Receptors (TLRs) and downstream Thioredoxin Interacting Protein (TXNIP) and NOD-like 1-7 receptor protein 3 (NLRP3) inflammasome axis in models of AD. Therefore, we hypothesized that genetic deletion of TXNIP would protect against activation of TLR pathway and TXNIP-NLRP3 inflammasome axis in the brain of a mouse model of high fat diet (HFD)-induced obesity.

Methods: Six-weeks old age- and gender-matched wild-type mice (WT) and TXNIP knock out (TKO) mice were randomized for normal diet (WT-ND & TKO-ND) or HFD (WT-HFD & TKO-HFD) for 8- or 18-weeks. Hippocampus brain samples were analyzed using western blot for expression of TLR pathway and TXNIP-NLRP3 inflammasome activation at both 8 and 18-weeks.

Results: After 8 weeks of HFD, there was a trend towards increased TLR2 receptor expression and NLRP3 inflammasome activation in WT-HFD, versus WT-ND control group, but not in TKO groups. After 18 weeks, there was increased levels of TLR4 and downstream TRAF6 and TICAM-1 in WT-HHFD compared with WT-ND control group and there was no change in neither the TKO-ND nor TKO-HFD groups.

Conclusion/Implications: Our results support the critical role of TXNIP in protecting against HFD-induced insulin resistance and associated systemic inflammatory response. Our Findings suggest the possibility of the long-term requirement of HFD-induced for instigating a sustained pro-inflammatory response in mouse hippocampus. Further studies are warranted for investigating the immunohistochemical distribution of the TXNIP-NLRP3 inflammasome and other proinflammatory pathways in addition to the cognitive function of all groups under ND and HFD conditions.

Identification of Synthetic Lethal Partners of Cancer Predisposition Genes

Authors: Hannah Neiger (presenter), Second Year Master of Pharmaceutical Sciences Student, College of Graduate Studies, California Northstate University,
Zhan Chen, Research Scientist, College of Medicine, California Northstate University, Xinyu Pei, Research Technician, College of Medicine, California Northstate University, Shymaa Bilasy, Laboratory Manager, College of Medicine, California Northstate University,
Emily L. Siegler, Second Year Medical Student, College of Medicine, California Northstate University, Sylvia Dinh, Second Year Medical Student, College of Medicine, California Northstate University, Tuan Tran, Department of Clinical and Administrative Sciences, College of Pharmacy, California Northstate University, Subarna Sinha, Stanford University, Yihui Shi, Department of Basic Sciences, College of Medicine, California Northstate University.

Introduction: Genes in which germline mutations confer increased risks of cancer are called cancer predisposition genes (CPGs). Given the increased cancer risk in people with germline CPG mutations, there is an urgent need to identify new therapeutic and chemopreventive strategies specific to these mutations. Most of these mutations are not directly druggable. Synthetic lethality (SL) provides the basis for an approach to identify new therapeutic targets for these mutations. SL refers to cell death caused by simultaneous perturbations of two genes while change of any one of them is nonlethal alone. We applied a novel computational method (Mining Synthetic Lethals, MiSL) that analyzes primary tumor data to identify SL partners. Here, we report the development of identification and validation of SL partners of CPGs using MiSL system.

Methods: We extracted the controlled TCGA germline mutation data generated from a previously published study. For each CPG mutation, we pooled the germline mutation data with somatic mutation data. We then refined MiSL to predict the list of SL partners for CPGs, particularly for *BRCA1* in this report, and subsequently validated the candidate genes using genetic and pharmacologic knockdown in isogenic *BRCA1* wild type and mutant cell lines.

Results: We have narrowed down to 16 SL partner genes for *BRCA1* by RNAseq and RT-PCR analysis first. We then validated the SL interaction between gene A and *BRCA1* with siRNA treatment in three isogenic pairs of cell lines in multiple biological assays.

Implications: Our findings suggest a potential therapeutic target for patients with *BRCA1* mutations. Future directions include introducing an inducible shRNA system, CRISPR genome editing, novel drug inhibitor, and *in vivo* studies to further validate findings. We will also elucidate the molecular mechanisms underlying interactions between gene A and *BRCA1*.

Investigating the Role of Microhomologies in Double-Strand DNA Break Repair

Authors:

Anand Singh, California Northstate University, College of Health Sciences, Department of Math & Sciences.

Ishaq Aslam, California Northstate University, College of Health Sciences, Department of Math & Sciences, Ishaq.

Advisor: Dr. Damon Meyer, California Northstate University, College of Health Sciences, Department of Math & Sciences.

Introduction: Double-stranded breaks (DSBs) are lesions in DNA structure that can be caused by radiation, chemical agents, and oxidizing agents. However, DSBs can be fixed through various repair mechanisms, including Microhomology Mediated End-Joining (MMEJ). The purpose of this study will investigate how the length and continuity of microhomologies influence the efficiency at which MMEJ occurs.

Methods: The study utilized an inducible a DSB recombination repair assay in *Saccharomyces cerevisiae* as a model eukaryotic organism to determine how varying amounts and continuity of microhomology influence the efficiency of MMEJ repair of DSBs.

Results: The results support the general trend that the longer and more continuous the microhomology length is, there is an increase in recombination frequency. For example, using 18 bp of microhomology with a 2 bp mismatch had the lowest recombination frequency, while the control full-length 311 bp had the highest recombination frequency.

Conclusion/Implications: Findings from this research are significant in understanding the MMEJ process and how microhomologies are utilized during DSB repair to influence efficiently. In addition, this research can be used for further studies when looking at how MMEJ can be implicated in the development and progression of various cancers. Future research would investigate the various enzymes such as Rad51 & Pol4 and their functions in the MMEJ pathway in repairing DSBs as targets for cancer proliferation.

Women with Fragile X-associated Tremor/Ataxia Syndrome

Andrea Schneider[1,2] PhD, Scott Summers[4] MD, Flora Tassone[5] PhD, Andreea Seritan[6] MD, David Hessl[1,4] PhD, Paul Hagerman[5] MD, Randi Hagerman[1,2] MD

Author affiliations:
[1]Medical Investigation of Neurodevelopmental Disorders (MIND) Institute and [2]Department of Pediatrics, [3]School of Medicine, [4]Departments of Psychiatry and Behavioral Sciences, and [5]Department of Biochemistry at the University of California-Davis, Medical Center, Sacramento, CA; [6]University of California, San Francisco, Psychiatry

Abstract

Background:

Fragile X-associated Tremor and Ataxia Syndrome is a late-onset neurodegenerative disorder linked to the *FMR1* premutation.

Objectives:

FXTAS in women is far less common than in men, and this study represents the largest sample reported to date.

Methods:

53 female premutation carriers with FXTAS ($Mean_{age}$ 66.83 years, FXTAS stages 2-5) and 55 age- and demographic background-matched control participants ($Mean_{age}$ 61.94 years) underwent a comprehensive molecular, physiological, neuropsychological, and psychiatric assessment.

Results:

The large sample of female premutation carriers showed a wide range of variability of clinical signs and symptom progression. The imaging results showed MCP sign in only 6 patients; other symptoms included high signal intensity in the splenium of the corpus callosum, and diffuse cerebral deep white matter changes, e.g. in the pons are more common. The rate of psychiatric disorders, especially depression, is higher than in the general population. There is a clear impairment in executive functioning and fine motor skills in connection with a higher FXTAS stage. There is no indication of cognitive decline with standardized measures.

Conclusions:

The manifestation of FXTAS symptoms in female carriers can be diverse with a milder phenotype and a lower penetrance than those observed in male premutation carriers. The MCP sign is present in only a small percentage of the sample, and we propose that the imaging criteria for FXTAS in women need to be expanded.

(Abstract: 226 words)

Financial Disclosures/COI: RH has received funding from Zynerba and Ovid for carrying out treatment studies in patients with fragile X syndrome. She has also consulted with Zynerba and Fulcrum regarding treatment studies in individuals with fragile X syndrome. DH has received consulting fees from Novartis, Roche, Seaside Therapeutics, and Marinus for design of fragile X clinical trials. The other authors report no conflicts of interest.

Funding: This work was supported by grant numbers HD036071 (NICHD), UL1DE019583 (NIDCR), RL1AG032115 (NIA), AG18442 (NIA), UL1 TR000002 and linked award TL1 TR000133, Health and Human Administration of Developmental Disabilities 90DD0596 and by

the NIH-funded MIND Institute Intellectual and Developmental Disabilities Research Center (U54 HD079125).

Ethical Compliance Statement

This study was approved by the IRB of the University of California at Davis, Protocol-ID: 240410-7, study: Characterization and Treatment of CNS Abnormalities in Carriers of Fragile X, and IRB ID: 254134-23, study: Genotype-Phenotype Relationships in Fragile X Families, FWA No: 00004557, Expiration Date: December 22, 2020, IORG: 0000251. Informed consent was obtained from all patients and control participants, who signed an informed consent document before the beginning of study participation.

The Role of C4a on ERK and Akt Activation in High Glucose-cultured Human Umbilical Venous Smooth Muscle Cells (UVSMCs)

Victor Cuyugan Changcoco, College of Pharmacy, California Northstate University

Mengyao Liu, Master Program of Pharmaceutical Science College of Graduate studies, California NorthState University.

Advisor: Hongbin Wang, PharmBS, MS, Ph.D. College of Pharmacy, College of Medicine, and Master Program of Pharmaceutical Science program in College of Graduate Studies, California Northstate University.

Introduction: Diabetes is characterized by chronic hyperglycemia which can cause diseases that include neuropathy, nephropathy, retinopathy, PAD, and CAD. Thrombin, a serine protease, which regulates platelet activation and various cellular functions, plays a key role in diabetes through its interaction with the PAR 1/4 G protein-coupled receptors. C4a, a fragmented peptide derived from the complement C4, has been linked to the initiation and development of diabetes, acts as a ligand to PAR-4. Multiple studies demonstrated that ERK and Akt signaling pathways are involved in thrombin-mediated vasculopathy. In the present study, we investigate the possible role of C4a on ERK and Akt activation in hyperglycemic culture of human umbilical venous smooth muscle cells, which will help elucidate the role of C4a in thrombin-mediated diabetic vasculopathy.

Methods: Human UVSMCs were grown in smooth muscle cell growth medium with 5.5, 15, or 25 mM of glucose. To maintain the osmolarity, mannitol was supplemented in 19.5, 10, and 0 mM respectively. The cells were seeded and incubated in 37°C with 5% CO_2. After 24h, the cell culture medium was changed to 5.5, 15, or 25 mM glucose and incubated for 72 and 96 hrs. Western blots of b-actin were used as a loading control. After C4a (0.3 mM) treatment at different time intervals (0, 5, 10, 15, 30, and 60 min), Cell lysates were collected to check if C4a could activate ERK and Akt by using anti-phospho-ERK, phospho-Akt (Thr308), and phospho-Akt (Ser473) antibodies.

Results: 1) C4a increases ERK activity through phosphorylation of ERK 2) We observed that hyperglycemia increases PAR-4 expression in human UVSMCs. 3) Under hyperglycemic condition, C4a decreases p-ERK and p-Akt activation, while under the normal glucose conditions, C4a time-dependently increases p-ERK and p-Akt activation. In addition, hyperglycemic condition can trigger p-ERK and p-Akt activation. Our data demonstrated that C4a could regulate ERK and Akt signaling pathways under hyperglycemic conditions, suggesting it might play a regulatory role in thrombin-mediated diabetic vasculopathy.

Conclusion: The current study revealed that exposure of human UVSMCs to high glucose selectively induces PAR-4 expression. In addition, C4a under hyperglycemic (25 mM) conditions, seem to decrease p-ERK and p-AKT activation while under normal glucose conditions (5.5 mM), time-dependently increases their activation. The results suggest that C4a can play a role at mitigating vascular cellular proliferation in a hyperglycemic environment such as diabetes.

Various Point-mutations in the CCR5 Gene Cause Decrease in Its Activity as Co-receptor in HIV Infection.

Authors:

Mary Jabari (presenter), California NorthState University, College of Graduate Studies, MPS student.

Advisor: Dr. Ghalib Alkhatib, Department of Basic Sciences, California NorthState University, College of Medicine.

Introduction: Human immunodeficiency virus (HIV) is a virus that attacks the body's immune system. HIV leads to acquired immunodeficiency syndrome (AIDS) if left untreated, which has no cure yet. The CC chemokine receptor 5 (CCR5) is a transmembrane protein that is found on the surface of white blood cells and is used as a co-receptor by the HIV to infect cells. The CCR5 gene was first identified in 1977 but did not become a subject of great public interest until 2009, when an HIV positive individual transplanted with bone marrow from a donor with a homozygous *CCR5*-Δ32 mutation, became HIV negative despite stopping anti-retroviral (ARV) therapy. This seminal clinical case study was founded on decades of work showing the role of CCR5 as a co-stimulator in T-cell function, activation, and the production of antigen specific T-cells. These studies showed the *CCR5*-Δ32 mutation to cause deletion of 32-base pairs in *CCR5*, leading to non-functional expression of this gene that does not localize to the cell surface. These mechanistic findings along with the discovery of CCR5 as a necessary co-receptor for entry of macrophage tropic HIV strains led to increased interest in this gene as a target for HIV treatment and other immunological processes.

Recent studies reported some point mutations in the CCR5 gene isolated from HIV seropositive patients. The reported point mutations were unique and different from those observed in HIV seronegative individuals. In this study we generated point mutations that correspond to those reported in HIV+ and HIV- individuals. The mutations were expressed using a reporter gene activation assay that specifically detects CCR5 coreceptor function. Our results showed that CCR5 mutants that correspond to those naturally isolated from HIV+ patients had lower CCR5 coreceptor function. In contrast, mutations that correspond to those isolated form HIV- individuals had comparable CCR5 coreceptor function to the wild type CCR5.

Experiments are underway to analyze the cell surface expression of these mutants to elucidate the mechanism of reduced CCR5 coreceptor function.

Explosive and Engaging: Working with National Parks for Authentic Assignments and Student Engagement

Author: Dr. Jill Dahlman, Assistant Professor, CNUCHS

Student engagement in the writing classroom has proven to be difficult in the past because of the reliance upon genre-based assignments (narrative, analysis, compare/contrast), which are typically written for a solitary audience: the instructor. The partnership between CNU CHS and Lassen Volcanic National Park will provide students with authentic writing assignments, providing an audience outside of the individual instructor. For students who view English as something to "get through" or as a box to tick in the general education requirement, a public audience creates an arena for the student's voice to be heard and teaches communication and rhetoric skills beyond the genre-based assignment. These partnerships push students outside of their comfort zone to consider an audience outside of the instructor and provide a necessary service for the partner organization. This discussion of the virtual partnership with Lassen Volcanic National Park will provide a springboard to a conversation about the process, benefits, and possible issues surrounding authentic writing assignments.

The Impact of Empiric Antibiotics Use in COVID-19 Patients: A Retrospective Cohort Study

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Introduction: Antibiotic overuse during the COVID-19 pandemic is increasingly being reported, despite infrequent bacterial co-infection. Empiric antibiotic indication and timing remains in question, which highlights a need for studies that can guide judicious antimicrobial prescribing and antimicrobial stewardship strategies. The objectives of this study are to describe the prevalence and selection of empiric antibiotic use for pneumonia in COVID-19 patients, determine the rate of bacterial coinfection, and assess the clinical outcomes of COVID-19 patients receiving empiric antibiotics for pneumonia.

Methods: We conduct a retrospective, institutional review board-approved, multicentered cohort study of COVID-19 patients aged 18 and older with diagnosis of pneumonia between July 1st 2020 and September 31st 2020. Patients who were on active antibiotics prior to admission or transitioned to comfort care within 5 days of hospitalization were excluded. Patients will be matched according to their baseline characteristics and categorized into either the ICU or the Floor cohort. Each cohort will then be stratified based on their antibiotic exposure status (exposed vs. not exposed) and duration of antibiotic therapy (>5 days vs. ≤5 days). The proportion of each group will be reported using descriptive statistics, and their outcomes will be compared using statistical analysis.

Results: Empiric antibiotics for pneumonia and duration of therapy, along with microbiological results and oxygen requirements will be recorded for approximately 650 patients. Clinical outcomes of those receiving empiric antibiotics will be compared to those who did not or received shorter course of antibiotics. Clinical outcomes to examine include hospital length of stay, treatment complications such as ICU admission and antibiotics-induced adverse events such as *Clostridium Difficile* infection.

Conclusion/Implications: Very limited studies have investigated the impact of excessive antibiotic use on health outcomes of hospitalized COVID-19 patients. This study will address this gap in evidence and provide insight on antibiotic prescribing in COVID-19 patients.

Effects of Physical Activity on the Mechanisms of Sleep

Authors:

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Introduction: The expectation that exercise will benefit sleep can partly be attributed to traditional hypotheses that sleep serves energy conservation, body restoration, or thermoregulatory functions, all of which have guided much of the research in this field. Research has shown that sleep disturbances could possibly impair a person's cognitive performance or capacity for exercise and increase the risk of exercise-induced injuries.

Methods: Our population includes 15,701 observations. The cohort has been followed into young adulthood with four in-home interviews when the sample was aged 24-32. Survey data were collected using a 90-minute CAPI/CASI instrument. Following the interview, interviewers took physical measurements and collected biological specimens and a medication log. This research design took a closer look at their general health and diet, sleep patterns, and daily activity.

Results: After adjusting for the potential confounding factor of, t*ime of day you had vigorous activity in the past 24 hours*, general health was significantly associated with the likelihood of snoring/stops in breathing, such that those who did engage in vigorous activity were about 1.7 times more likely to snore/stop breathing leading to poor sleep hygiene. This contradicts our original hypothesis, yet still fields significance for the opposite conclusion.

Conclusion/Implications: These findings will fill any gaps that researchers may have left when studying the effects of exercise on sleep. Despite a large number of studies conducted on sleep and exercise, researchers have not come to a conclusion on the impacts each variable has on the other. These findings may open doors for researchers to dive deeper into the bodily mechanisms impacted when we engage in physical activity. Future advances in technology will also aid research.

Medical Student Anxiety Levels and Help-Seeking Behavior

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Introduction: There is limited knowledge of the care-seeking behavior in persons with anxiety, especially at the medical school level. With the considerable rigor and stress of medical school, we have sought to better understand how medical students seek to address high/moderate anxiety levels by quantifying the utilization of counseling services and wellness events in medical students experiencing anxiety. This abstract describes the project and its outcomes.

Methods: Well-being data has been collected over three years. A 20-minute online survey has been provided to all medical students at the California Northstate University COM biannually. The survey includes demographic data, wellness events attended, and whether the student has seen a mental healthcare provider over various intervals. The bulk of the data are in the form of a Likert scale, or ordinal values, testing for levels of anxiety, burnout, etc. The anxiety quantifier used in the survey is the GAD-7 scale, the most commonly used self-reporting scale for generalized anxiety disorder.

Results: 248 students have completed the survey. Of those who answered the survey, 21 of 248 students (8.47%) reported high/moderate anxiety, and 15 of 21 (71.4%) students with high/moderate anxiety attended either counseling or wellness events, with 9 of 21 (42.9%) seeking counseling and 10 of 21 (47.6%) attending wellness events. When isolating for help seeking in the form of attending wellness events, there is no statistically significant correlation with high/moderate anxiety level; however, there is a statistically significant correlation with attending counseling and high/moderate anxiety level.

Conclusion/Implications: Determining how mental health services at medical school are utilized by students to either maintain or improve anxiety can encourage more educational institutions to provide such resources for their students, as more than 70% of students with high/moderate anxiety utilized wellness resources.

Targeting ER Stress as a Promising Strategy to Reprogram Immunosuppressive Myelopoiesis in the Tumor Microenvironment.

Authors:

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Elucidating the central mechanisms that govern the regulatory and tumor promoting functions of Myeloid-derived suppressor cells (MDSC) in tumors is fundamental for developing successful therapies against cancer. Here, we uncovered for the first time the role of the intrinsic activation of the endoplasmic reticulum (ER) associated PKR-like kinase (PERK) as a driver of the immunosuppressive polarization of tumor-MDSC. Upon infiltration to tumors, MDSC undergo ER stress/expansion; activate the ER stress mediators, IRE1α and PERK; and acquired a superior capacity to impair T cell function. Therapeutic mitigation of ER stress or inhibition of PERK delayed tumor growth, overcame MDSC-linked T cell suppression, and synergized with checkpoint immunotherapy. Also, conditional deletion of PERK reprogramed tumor-MDSC into immunostimulatory cells capable of priming protective tumor-specific $CD8^+$ T cell immunity. Mechanistically, PERK signaling in MDSC activated the transcription factor, NRF2, thereby preventing the excessive accumulation of reactive oxygen species (ROS) and supporting mitochondrial respiratory homeostasis. Moreover, PERK-null MDSC showed elevated levels of cytosolic mitochondrial DNA (mtDNA), thereby provoking STING dependent type I interferon responses. Re-activation of NRF2 signaling, elimination of cytosolic mtDNA, conditional-deletion of STING, or blockade of interferon alpha/beta receptor I restored the immunoregulatory potential of PERK-deficient MDSC. Our findings reveal a pivotal role of PERK in the regulatory activity of tumor-MDSC and illustrate strategies to reprogram the immunosuppressive myelopoiesis occurring in tumors, thereby amplifying the effects of cancer immunotherapy.

POSTERS

(Ordered by Track)

Track 1

Basic Research/Cancer/Natural Products

(Track 1 - Teams Link)

Sirtuin-3 Pharmacologically Promotes Insulin Sensitivity Through PI3/AKT and its Downstream Pathway in Adipocytes

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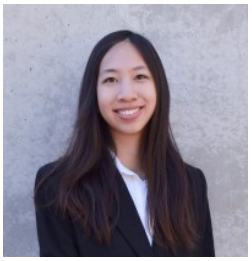

Introduction: Sirtuin 3 (Sirt3) is a major mitochondrial deacetylase enzyme found in many metabolic tissues. Sirt3 was shown to decrease in diabetes type 1 and 2. Sirt3 knockout mice showed insulin resistance, glucose intolerance, and accelerated obesity. Elucidating Sirt3's molecular mechanism in regulating insulin sensitivity in adipocytes may provide new insights into treatment of obesity and type 2 diabetes.

Methods: We cultured and differentiated 3T3-L1 cells, treating them with either 1μL, 5μL, or 10μL of Sirt3 inhibitor (3-TYP) or 50μL or 100μL of Sirt3 activator (Honokiol). Through qPCR, we evaluated changes in adipocyte gene markers such as peroxisome proliferator activated receptor gamma (PPAR γ) as well as lipolysis gene markers such as ATP-citrate lyase (ACL), and lipoprotein lipase (LPL). Through western blot, we identified if Sirt3 involves Insulin/IGF-1 (Insulin-like Growth Factor-1) signaling pathway. Data was analyzed using Graphpad Prism Software, and statistical analyses by using a two-tailed unpaired followed by *post hoc* Dunnette's multiple comparisons.

Results: An increase in phosphorylation of FoxO1/FoxO3a/FoxO4, IGF-IR beta, mTOR (mammalian target of rapamycin), and IRB were found in Honokiol treated cells. Interestingly, PPAR-γ and LPL expression significantly increased while ACL expression decreased. In contrast, FoxO1/FoxO3a/FoxO4 phosphorylation, mTOR and IRB expression were decreased in 3-TYP treated cells. There was also a significant increase in LPL and a slight increase in PPAR γ in the 50μM condition.

Conclusion: 3-TYP caused a decrease in LPL, which is commonly associated with insulin resistance, obesity, dyslipidemias, etc. In sharp contrast, honokiol caused an increase in LPL, indicating that Sirt3 activation can improve insulin resistance. Moreover, Sirt3 activation causes downstream activation of insulin receptors and mTOR. These results indicate that Sirt3 activation improves insulin resistance while Sirt3 inhibition leads to insulin resistance via insulin signaling pathway regulation.

Investigating the Role of Microhomologies in Double-Strand DNA Break Repair

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Introduction: Double-stranded breaks (DSBs) are lesions in DNA structure that can be caused by radiation, chemical agents, and oxidizing agents. However, DSBs can be fixed through various repair mechanisms, including Microhomology Mediated End-Joining (MMEJ). The purpose of this study will investigate how the length and continuity of microhomologies influence the efficiency at which MMEJ occurs.

Methods: The study utilized an inducible a DSB recombination repair assay in *Saccharomyces cerevisiae* as a model eukaryotic organism to determine how varying amounts and continuity of microhomology influence the efficiency of MMEJ repair of DSBs.

Results: The results support the general trend that the longer and more continuous the microhomology length is, there is an increase in recombination frequency. For example, using 18 bp of microhomology with a 2 bp mismatch had the lowest recombination frequency, while the control full-length 311 bp had the highest recombination frequency.

Conclusion/Implications: Findings from this research are significant in understanding the MMEJ process and how microhomologies are utilized during DSB repair to influence efficiently. In addition, this research can be used for further studies when looking at how MMEJ can be implicated in the development and progression of various cancers. Future research would investigate the various enzymes such as Rad51 & Pol4 and their functions in the MMEJ pathway in repairing DSBs as targets for cancer proliferation.

Sumac Induces Mitochondrial Stress and Toxicity in KRAS-dependent Pancreatic Cancer Cells

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Michael and James contributed equally to this work.



Introduction. Pancreatic cancer (PCa) has a high mortality rate and only a 10% 5-year survival rate. It is difficult to treat due to incomplete understanding of the molecular events of drug therapy. Our goal is to identify small molecule compounds with synthetic lethality in cellular models of KRAS-dependent pancreatic adenocarcinoma.

Methods. Our preliminary experiments demonstrate that aqueous extracts of the Middle Eastern spice-plant sumac induce cytotoxicity in two cultured human pancreatic cancer cell lines with KRAS gene mutations; MIA PaCa-2 (G12C) and PANC-1 (G12V and G12D) but not in normal fibroblasts. We hypothesized that sumac causes mitochondrial compromise through derangement of membrane potential leading to apoptosis. To test this, we treated PCa cells *in vitro* with increasing concentrations of aqueous extracts of sumac (0, 0.03, 0.3 and 3.0 mg/mL) and measured 1) mitochondrial membrane potential using TMRE assays, 2) ROS production using DHT assays, 3) ATP levels using fluorimetry, and 4) activated caspases 3 and 7.

Results. Our data show that sumac treatment 1) ameliorated ROS production, 2) abrogated mitochondrial membrane potential, 3) activated caspases 3 and 7, and 4) reduced cellular ATP levels in a dose-dependent manner, all preferentially in PANC-1 compared to MIA PaCa-2 cells. These data suggest that sumac mediates "synthetic lethality" in pancreatic cancer cells based on type of KRAS gene mutation. We also hypothesized that the observed ATP reduction would alter levels of SIRT3, which is a mitochondrial physiology regulating deacetylase enzyme. Immunoblot data show paradoxical increase in SIRT3 in a dose-dependent manner, suggesting other roles for SIRT-3. Using HPLC-based NMR spectroscopy, we identified the active compound in the aqueous sumac extract to be [(2R, 3R, 4S, 5R)-3, 4, 5, 6-tetrakis [(2-deuterio-3, 4, 5-trihydroxybenzoyl)oxy]oxan-2-yl] methyl-2-deuterio-3, 4, 5-trihydroxybenzoate.

Conclusion. Sumac targets hitherto unknown mitochondrial signal transduction pathways and is synthetic lethal for the KRAS mutant G12V and G12D.

Identification of Synthetic Lethal Partners of Cancer Predisposition Genes

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Introduction: Genes in which germline mutations confer increased risks of cancer are called cancer predisposition genes (CPGs). Given the increased cancer risk in people with germline CPG mutations, there is an urgent need to identify new therapeutic and chemopreventive strategies specific to these mutations. Most of these mutations are not directly druggable. Synthetic lethality (SL) provides the basis for an approach to identify new therapeutic targets for these mutations. SL refers to cell death caused by simultaneous perturbations of two genes while change of any one of them is nonlethal alone. We applied a novel computational method (Mining Synthetic Lethals, MiSL) that analyzes primary tumor data to identify SL partners. Here, we report the development of identification and validation of SL partners of CPGs using MiSL system.

Methods: We extracted the controlled TCGA germline mutation data generated from a previously published study. For each CPG mutation, we pooled the germline mutation data with somatic mutation data. We then refined MiSL to predict the list of SL partners for CPGs, particularly for *BRCA1* in this report, and subsequently validated the candidate genes using genetic and pharmacologic knockdown in isogenic *BRCA1* wild type and mutant cell lines.

Results: We have narrowed down to 16 SL partner genes for *BRCA1* by RNAseq and RT-PCR analysis first. We then validated the SL interaction between gene A and *BRCA1* with siRNA treatment in three isogenic pairs of cell lines in multiple biological assays.

Implications: Our findings suggest a potential therapeutic target for patients with *BRCA1* mutations. Future directions include introducing an inducible shRNA system, CRISPR genome editing, novel drug inhibitor, and *in vivo* studies to further validate findings. We will also elucidate the molecular mechanisms underlying interactions between gene A and *BRCA1*.

RELT family member-induced apoptosis: elucidation of pathway and relevance to breast cancer.

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Advisor: John Cusick, Ph.D., California Northstate University College of Medicine.

Introduction: Receptor Expressed in Lymphoid Tissues (RELT) is a Tumor Necrosis Factor Receptor member that has two homologous binding partners, RELL1 and RELL2, and collectively, these three proteins are described as RELT family members. RELT family member expression has previously been shown to induce apoptosis in human epithelial cells and one goal of the project was to explore whether RELT family members could induce death in breast cancer cell lines. MyoD family inhibitor domain-containing protein (MDFIC) is a protein that binds RELT family members, and this study also sought to elucidate whether co-expression of MDFIC deletion mutants influence RELT-induced death.

Methods: Lipofectamine was used to transiently transfect DNA expression plasmids into cell lines and western blotting was used to confirm expression of the expected RELT family members. The breast cancer cell lines MDA-MB-231 (231) and MCF-7 were utilized in addition to the embryonic epithelial kidney cell line HEK-293 (293). A luciferase assay was used to assess cell viability by measuring the amount of cellular ATP present in cells following transfection of expression plasmids. T tests were used to determine statistical significance.

Results: RELL2 expression enhances cell death in the breast cancer cell line 231 while the ability of RELT to induce death in breast cancer cell lines is currently inconclusive. An additional finding was that co-expression of a MDFIC mutant lacking the carboxy-terminus enhances RELT-induced death in 293 cells.

Conclusions: RELL2 induces death in a breast cancer cell line, and future experiments are needed to clarify whether RELT induces death in breast cancer cells. This area of investigation is significant since autoantibodies directed against RELT are strongly correlated with breast cancer. Co-expression of a MDFIC mutant lacking the carboxy-terminus enhances RELT-induced death in 293 cells, providing the first evidence of a separate protein that influences RELT-family member induced cell death.

Gallstone Diseases: An Overview and Herbal Treatment

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Introduction: This study is to examine the Gallstone Disease and the methodologies utilized in treatments, such as herbal medicines, nutritional factors, surgeries, and none-surgical treatments to remove the gallstones from patients. Gallstones are ancient disease, having occurred more than 3500 years ago according to autopsies performed on Egyptian and Chinese mummies. The gallstone disease's treatments, such as Cholecystectomy and other types of invasive surgeries have side effects; so, new remedies should be explored with available delivery methods, feasible absorption, and compatible metabolism of medications with little/no side effects.

Methods: The main methodology utilized to better understand the underlying mechanism that effectively minimizes, interferes in the process of formation, and/or complete eradication of gallstones paved to be fruitful in examination of global case studies, nutrients intakes, and herbal medicines' role in many aspects of this disease. Furthermore, we have conducted research on herbal, chemical, surgical, and none-surgical treatments by examining cases that have performed experimental procedures for each methodology described and evaluated the collective results.

Results: Based on observations and case studies' results inferred, herbal medicines have the potential to treat some of the gallstones effectively while some remedies are utilized for the prevention and/or treatment of relevant organ diseases believed to have protective functions and properties to assist in gallbladder's healthy functionality.

Conclusion/Implications: The universal conclusion is that future treatments should avoid or minimize the side effects on patients. The side effects-free methodologies include green leaves and herbal medicines that have chlorophyll, antioxidants, vitamins, and some minerals, and essential nutrients that could decrease the risks of either contracting, to prevent, or some times assist in the treatment of gallstone diseases by dissolution and passages facilitation to relieve pressure on gallbladder as a result of its contractions after a lipid rich meal which requires further study.

Complement activation fragment C4a/C4a^{desArg} activates Akt through PAR1/4 in human endothelial cells

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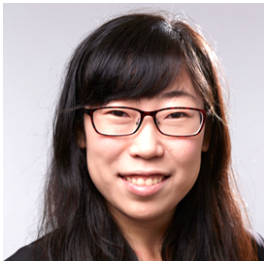

Introduction: Complement system, a part of the innate immune system, promotes inflammation and assists phagocytic cells for engulfing the damaged cells. Upon the activation of the classical and the lectin pathways of complement system, the complement C4 were cleaved to from C4a fragment (77 aa). In the previous study, C4a was demonstrated to increase human endothelial cells permeability through G protein-coupled receptor Protease Activated Receptor (PAR)1. However, the role of C4a or C4a^{desArg} on Akt signaling pathway in the endothelial cells is still unknown. We hypothesize that C4a/C4a^{desArg} will modulate the Akt signaling pathway to affect the endothelial cell survival and growth as a non-canonical agonist for PAR1/4.

Methods: Human endothelial cells (HMEC-1and EA.hy926) were treated with C4a (0.3 □M) or C4a^{desArg} (1□M) for 0, 5, 10, 15, 30, and 60 min. For the inhibition of PAR1 or PAR 4, cells were pre-treated with PAR4 antagonists (300 □M tcY-NH2 or 1□M ML354) or PAR1 antagonists (10 □M RWJ-56110 or 1□M SCH79797) for 30 min. After the treatment, the Western blots of phospho-Akt (Thr 308) and phospho-Akt (Ser 473) and total-Akt were assessed by using anti-phospho-Akt (Ser 473 or Thr 308) and anti-Akt antibodies.

Results: C4a or C4a^{desArg} treatment could time-dependently increase Akt activation in both HMEC-1 and EA.hy926 endothelial cells. Pre-treatment PAR1 or PAR4 antagonists in both cell lines could further enhance C4a-induced Akt activation. However the inhibition of PAR1 or PAR4 can decrease C4a^{desArg}-induced-Akt activation.

Conclusion: Our data revealed the role of the interaction of C4a/C4a^{desArg} with PAR1/4 in Akt activation in human endothelial cells. Understanding the Akt activation downstream pathway through the C4a/C4a^{desArg} -PAR1/4 signaling axis in the human endothelial cells could help to develop the innovative therapeutics for endothelium injury.

Future direction: We will explore the downstream effectors of C4a/C4a^{desArg} -PAR1/4 -Akt signaling pathway in human endothelial cells.

Extending the σ-Hole Motif for Sequence-Specific Recognition of the DNA Minor Groove

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Introduction: Aberrant transcription factor expression is linked to a wide range of chronic diseases (e.g., cancer). With a lack of protein binding targets for these diseases, and an urgent need for more effective, targeted therapies, there have been intense research efforts to design new synthetic compounds that target nucleic acids. As AT-specific heterocyclic diamidine DNA minor groove binders have been shown to have useful activity in clinical trials, our efforts have focused on broadening the sequence-specific recognition of these compounds through improved GC affinity and selectivity.

Methods: All compounds were created via total synthesis. Surface plasmon resonance (SPR) and circular dichroism (CD) were performed to determine compound binding affinity/selectivity and DNA binding mode, respectively. The results from the SPR and CD studies were confirmed through mass spectrometry. Key compound-DNA binding interactions were identified with molecular modeling software.

Results: Changing the Cl substituent on the phenyl ring of heterocyclic diamidine DB2759 to Br (DB2801) resulted in a retention of strong single GC bp target sequence (AAAGTTT) binding affinity and selectivity, while moving the Cl substituent to the opposite phenyl ring (DB2789) resulted in a slight improvement in target sequence binding affinity with no loss of selectivity. The addition of isopropyl substituents to the amidines resulted in the strongest AAAGTTT binding affinity, but came with reduced selectivity. Other structural changes resulted in a loss of AAAGTTT binding affinity and/or selectivity.

Conclusion/Implications: We designed and synthesized, for the first time, a broad array of heterocyclic diamidines that can bind to mixed AT and GC sequences of DNA. From our research, we have identified three GC-specific heterocyclic diamidine lead compounds for therapeutic testing, each of which has a halogen substituent adjacent to one amidine: DB2759, DB2801, and DB2789. We plan to test our lead compounds for anti-cancer activity through promoter inhibition of oncogene transcription factors *in vitro*.

Modulation of Molecular Targets of Non-Alcoholic Fatty Liver Disease with Natural Plant Extracts in Hepg2/C3A Cells

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Introduction: Nonalcoholic fatty liver disease (NAFLD) is a progressive disease characterized by lipid accumulation in hepatocytes. The prevalence of NAFLD is increasing, however no treatments are currently available. Many botanicals are capable of regulating lipid metabolism. The purpose of this investigation was to screen natural products for efficacy in decreasing lipid accumulation and expression of genes associated with nonalcoholic fatty liver disease in hepatocytes.

Methods: Aqueous extracts were derived from commercially available artichoke, noni, licorice, sumac, and lemongrass. Cell viability was determined using CCK-8 assay following 48 and 72 hour treatment of extracts at concentrations of 30-2.0 $x10^3$ µg/mL. HepG2/C3A cells were maintained in EMEM with 10% fetal bovine serum. Triglyceride accumulation was induced using serum starvation for 24 hours followed by treatment of 1 mM Oleic acid and measured by staining intracellular lipid with Oil red O, eluting pigment, and measuring absorbance at 545 nm. Genetic expression was characterized through qPCR. Significance was determined using a 2-tailed Student's t-Test ($p< 0.05$).

Results: Oleic acid treatment caused a dose-dependent increase in intracellular lipids. Treatment with lemongrass, artichoke, and noni significantly decreased lipid accumulation ($p= 0.01$, 0.04, and $0.8x10^{-4}$). All extracts caused downregulation of SREPB1c. Noni suppressed PPARγ expression ($p=0.04$). Lemongrass and licorice suppressed PPARα ($p= 0.03$, 0.03). Artichoke induced SCD-1 expression while licorice suppressed its expression ($p= 2x10^{-3}$, 0.02). Artichoke extract induced expression of MMP9 while MMP9 expression was suppressed by noni extract ($p= 0.01$, 0.03).

Conclusion/Implications: The extracts from lemongrass, artichoke, and noni can significantly decrease the accumulation of lipids characteristic of nonalcoholic steatohepatitis indicating their potential use as complementary therapies. Noni extract displayed promise as a therapeutic agent since it can suppress the expression of MMP9 and PPAR□. Future studies will define the active compounds and determine their in vivo efficacy on NAFLD.

Quantification of intracellular lipids in 3T3-L1 adipocytes using image analysis software

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Introduction: Efficient measurement of intracellular lipid is crucial for the investigation of several processes underlying health conditions. One commonly employed technique involves staining of lipids, pigment elution, and spectrophotometry of eluate. However, this method is notoriously unreliable and does not result in quantitative data. Alternatively, lipid analysis assay is accurate and reliable but costly and time consuming. In this study, we aimed to develop an alternative method for quantifying intracellular lipids using image analysis software of the stained cell cultures and to compare the results to the lipid analysis assay.

Methods: Adipocytes were cultured from 3T3-L1 preadipocytes according to established protocols utilizing media enriched with dexamethasone, isobutylmethylxanthine, and insulin. Intracellular lipid gradient was established experimentally using variable insulin treatment duration. Intercellular lipids were measured using lipid analysis assays, Oil Red O assays, and experimental image analysis. For the later two, Oil Red O staining was followed by elution and spectrophotometry or microscopy of random fields under 10x magnification. A customized software program was developed using the LabVIEW programing language which measured the ratio of red pixels to total pixels as a proxy for lipid content. Correlation between assays types were determined for comparison.

Results: Lipid analysis assay demonstrated precision for lipid standards (R^2=0.98) and samples (R^2=0.85). The precision of image analysis (R^2=0.70) was higher than that of Oil Red O assay (R^2=0.01). Correlation between lipid and image analysis was higher(R^2=0.68) than that between lipid analysis and Oil Red O (R^2=0.13). Visual inspection corroborated the areas selected by the program as containing red pigment.

Conclusion/Implications: The experimental image analysis outperformed Oil Red O assay and correlated better with the lipid analysis assay. Therefore, image analysis assay can be regarded as a fast and affordable alternative method for lipid analysis.

The role of C4a on ERK and Akt Activation in High Glucose-cultured Human Umbilical Venous Smooth Muscle Cells (UVSMCs)

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Introduction: Diabetes is characterized by chronic hyperglycemia which can cause diseases that include neuropathy, nephropathy, retinopathy, PAD, and CAD. Thrombin, a serine protease, which regulates platelet activation and various cellular functions, plays a key role in diabetes through its interaction with the PAR 1/4 G protein-coupled receptors. C4a, a fragmented peptide derived from the complement C4, has been linked to the initiation and development of diabetes, acts as a ligand to PAR-4. Multiple studies demonstrated that ERK and Akt signaling pathways are involved in thrombin-mediated vasculopathy. In the present study, we investigate the possible role of C4a on ERK and Akt activation in hyperglycemic culture of human umbilical venous smooth muscle cells, which will help elucidate the role of C4a in thrombin-mediated diabetic vasculopathy.

Methods: Human UVSMCs were grown in smooth muscle cell growth medium with 5.5, 15, or 25 mM of glucose. To maintain the osmolarity, mannitol was supplemented in 19.5, 10, and 0 mM respectively. The cells were seeded and incubated in 37°C with 5% CO_2. After 24h, the cell culture medium was changed to 5.5, 15, or 25 mM glucose and incubated for 72 and 96 hrs. Western blots of b-actin were used as a loading control. After C4a (0.3 mM) treatment at different time intervals (0, 5, 10, 15, 30, and 60 min), Cell lysates were collected to check if C4a could activate ERK and Akt by using anti-phospho-ERK, phospho-Akt (Thr308), and phospho-Akt (Ser473) antibodies.

Results: 1) C4a increases ERK activity through phosphorylation of ERK 2) We observed that hyperglycemia increases PAR-4 expression in human UVSMCs. 3) Under hyperglycemic condition, C4a decreases p-ERK and p-Akt activation, while under the normal glucose conditions, C4a time-dependently increases p-ERK and p-Akt activation. In addition, hyperglycemic condition can trigger p-ERK and p-Akt activation. Our data demonstrated that C4a could regulate ERK and Akt signaling pathways under hyperglycemic conditions, suggesting it might play a regulatory role in thrombin-mediated diabetic vasculopathy.

Conclusion: The current study revealed that exposure of human UVSMCs to high glucose selectively induces PAR-4 expression. In addition, C4a under hyperglycemic (25 mM) conditions, seem to decrease p-ERK and p-AKT activation while under normal glucose conditions (5.5 mM), time-dependently increases their activation. The results suggest that C4a can play a role at mitigating vascular cellular proliferation in a hyperglycemic environment such as diabetes.

Activation of COX2/PGE2 Pathway is not Involved in Dedifferentiation of Cardiac Myofibroblasts Induced by Phorbol 12-myristate 13-acetate

Authors:

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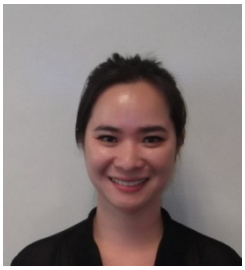
Advisor: Zhuqiu Jin: Department of Pharmaceutical Sciences, College of Pharmacy, California Northstate University.

Introduction: The differentiation of cardiac fibroblasts to myofibroblasts is considered to be a critical step in the activation and progression of cardiac fibrosis. TGFβ is one of the essential molecules that promotes transition of fibroblasts to myofibroblasts. Reversal of formed myofibroblasts to fibroblasts remains incompletely understood. In our previous studies, Phorbol 12-Myristate 13-Acetate (PMA) induces reversal of myofibroblast differentiation via PKC-independent mechanism. PGE2 has been shown to reserve differentiation of myofibroblasts of fetal and adult lung fibroblasts. The role of PGE2 in cardiac myofibroblast dedifferentiation remains unknow.



Methods: Human cardiac fibroblasts were cultured in fibroblast medium (FM)-2. TGF-beta1 (2ng/mL) was added to FM-2 for 48 hours to convert fibroblasts into myofibroblasts. PMA (50 ng/mL) or PGE2 (500 nM) was added into cultured cells for 48 hours, respectively. Expression of alpha-SMA, a biomarker of myofibroblasts, and FSP-1, the biomarker of fibroblasts, were detected by using western blotting and immunofluorescence. To explore the involvement of COX2/PGE2 pathway in PMA-induced reversal of cardiac myofibroblast differentiation, NS-398, the selective COX2 inhibitor, and PF-04418948, a selective PGE2 receptor antagonist, were applied. Endogenous levels of PGE2 in cardiac myofibroblasts were detected by using Elisa assay kit.

Results: TGF-beta1 promoted conversion of cardiac fibroblasts to myofibroblasts as evidenced by increased expression of alpha-SMA and reduced expression of FSP-1. Treatment with PMA dose-dependently attenuated expression of de novo myofibroblasts. Both NS-398 and PF-04418948 exerted no effects on PMA-induced reversal of cardiac myofibroblasts. Addition of PGE2 into culture medium had no effect on expression of alpha-SMA from myofibroblasts. PMA dose-dependently enhanced formation of PGE2 levels in cardiac myofibroblasts.

Conclusions: PMA-induced reversal of cardiac myofibroblast is independent of activation of COX2 and PGE2 pathway. The mechanism in PMA-induced reversal of cardiac myofibroblasts remains to be further explored.

Role of TXNIP in development of High Fat Diet-induced inflammation & early markers for Alzheimer's Disease.

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Introduction: Obesity and Insulin resistance are established risk factors for Alzheimer Disease (AD). Several studies have shown upregulation of pro-inflammatory Toll Like Receptors (TLRs) and downstream Thioredoxin Interacting Protein (TXNIP) and NOD-like 1-7 receptor protein 3 (NLRP3) inflammasome axis in models of AD. Therefore, we hypothesized that genetic deletion of TXNIP would protect against activation of TLR pathway and TXNIP-NLRP3 inflammasome axis in the brain of a mouse model of high fat diet (HFD)-induced obesity.

Methods: Six-weeks old age- and gender-matched wild-type mice (WT) and TXNIP knock out (TKO) mice were randomized for normal diet (WT-ND & TKO-ND) or HFD (WT-HFD & TKO-HFD) for 8- or 18-weeks. Hippocampus brain samples were analyzed using western blot for expression of TLR pathway and TXNIP-NLRP3 inflammasome activation at both 8 and 18-weeks.

Results: After 8 weeks of HFD, there was a trend towards increased TLR2 receptor expression and NLRP3 inflammasome activation in WT-HFD, versus WT-ND control group, but not in TKO groups. After 18 weeks, there was increased levels of TLR4 and downstream TRAF6 and TICAM-1 in WT-HHFD compared with WT-ND control group and there was no change in neither the TKO-ND nor TKO-HFD groups.

Conclusion/Implications: Our results support the critical role of TXNIP in protecting against HFD-induced insulin resistance and associated systemic inflammatory response. Our Findings suggest the possibility of the long-term requirement of HFD-induced for instigating a sustained pro-inflammatory response in mouse hippocampus. Further studies are warranted for investigating the immunohistochemical distribution of the TXNIP-NLRP3 inflammasome and other proinflammatory pathways in addition to the cognitive function of all groups under ND and HFD conditions.

Track 2

Infectious Diseases & COVID-19

(Track 2 - Teams Link)

Initiating Pediatric Antimicrobial Stewardship Program Pilot in a Community Hospital

Authors: Da Eun (Diane) Hwang, PGY-1 Pharmacy Resident, College of Pharmacy, California Northstate University.

Introduction: Current studies on the effect of pediatric Antimicrobial stewardship program (ASP) are driven from stand-alone pediatric hospitals. However, multiple studies of adult ASPs in community hospitals have demonstrated the similar clinical outcomes as large tertiary academic centers, despite limited resources and infectious disease expertise. Although Sutter Medical Center Sacramento (SMCS) is a community hospital where serves patients in the greater Sacramento area, we provide extensive services to a large pediatric population. Development of a pediatric ASP at SMCS should include feasible core strategies in limited resources with an effort to improve antimicrobial use and optimal care for pediatric patients. The aims of the pilot are to review previous antibiotic uses in pediatric patients at SMCS and to evaluate patients and ASP interventions after the pilot of the pediatric ASP.

Methods: From January 19st to February 5st, 2021, the ASP Pharmacist will provide standard antimicrobial stewardship to all patients admitted to the Pediatric units and Pediatric Intensive Care Unit at SMCS. Numbers and types of interventions made by ASP pharmacists, types of monitored antimicrobial indications and monitored antimicrobials that triggered a review will be collected. The data will be compared with the baseline information about historical antimicrobial use in the pediatric population at SMCS from January 1st to December 31st, 2019.

Results: The study is currently in process. It is expecting that the pediatric ASP will optimize antimicrobial use by reducing overall prescribed antimicrobials and further decreasing the use of restricted antimicrobials in pediatric patients.

Conclusion/Implications: This project is designed to evaluate the effectiveness of pediatric ASP at SMCS. The information learned from this study may offer benefits for patient outcome improvements by identifying different measures of the pediatric ASP for various antimicrobials dispensed in Pediatric units. This will also provide insights on the management strategies for pediatric pharmacists and pediatricians.

Early Antibiotic De-escalation in Patients with Febrile Neutropenia

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Introduction: In neutropenic patients, fever may be the only marker of a severe underlying infection as other signs and symptoms such as warmth and swelling may not be present. Consequences of febrile neutropenia (FN) can include chemotherapy dose reductions, therapy delay, and a predicted 1-month mortality of 3.4-7.5%. FN patients are treated with broad spectrum antibiotics, with the traditional endpoint for antibiotic de-escalation being neutropenia recovery. However, the guidelines are not clear and can be difficult to navigate in clinical practice, as there is no time frame or criteria for de-escalation. The overuse of antibiotics can place patients at risk for serious adverse drug reactions and incur additional costs with questionable benefit and lead to resistance, which results in longer hospital stays, higher medical costs and increased mortality. Recent literature strongly supports the early de-escalation of antibiotics in febrile neutropenia. As a patient with FN clinically improves but remains neutropenic, the purpose of continuing treatment with broad spectrum antibiotics becomes unclear. The purpose of this study is to evaluate the safety and efficacy of early de-escalation of antibiotics in the FN patient population at SMCS.

Methods: Quality improvement, retrospective cohort research, with target N = 400 patients. The primary objective is empiric antibiotic days of therapy with empiric antibiotics are defined as any antibiotic other than prophylactic dosing of levofloxacin, ciprofloxacin, and Bactrim. The secondary objectives of this study are: total number of days of fever, neutropenia duration in days, empiric vancomycin duration (measured in days of therapy), duration of admission, documented infection (positive cultures), occurrence of Clostridioides difficile infection, isolation of resistant strains (VRE), antibiotic adverse drug reactions (nephrotoxicity, other).

Results: Results of this study are pending; data is currently being collected. The hypothesis for this study is a decrease in empiric antibiotic days of therapy after increased pharmacist education and involvement in antibiotic de-escalation in febrile neutropenia. Secondary outcomes will capture whether there are differences in safety and efficacy associated with early antibiotic de-escalation.

Conclusion/Implications: The conclusion of this study is pending as data is currently being collected. If the hypothesis is supported by the results of this study, it would conclude that pharmacist involvement has a significant impact in the care for patients with febrile neutropenia. If secondary outcomes confirm the safety and efficacy of early antibiotic de-escalation, it would further add to the evidence supporting early antibiotic de-escalation in the management of febrile neutropenia.

Analysis of pharmacy protocol in the Evaluation of MRSA PCR in De-escalation of Vancomycin for Empiric Bacteremia

Authors: Jevons Lui, PharmD.

Advisor: Christine Chan, PharmD, BCPS, BCCCPS.

Introduction: Vancomycin is a commonly used antibiotic in the empiric treatment for bacteremia. Vancomycin overuse can be associated with the emergence of antibiotic resistance, ototoxicity, and nephrotoxicity. Rapid de-escalation for vancomycin is important to reduce adverse effects of vancomycin and to reduce vancomycin resistant organisms. Rapid diagnostic testing on blood specimens with active ASP support and interpretation follows guidelines issued by the Infectious Disease Society of America. The purpose of this study is to assess the implementation of a pharmacy protocol for rapid diagnostic test (RDT) of blood cultures resulted in a decrease of vancomycin duration of treatment (DOT). Secondary objectives are to assess time to result for RDT, blood culture final result, number of vancomycin levels, vancomycin cost, and pharmacist's time spent on vancomycin monitoring.

Methods: A retrospective chart review will be conducted with Epic Electronic Health Record (EPIC) at Sutter Eden Medical Center in Castro Valley. The study will include adult patients with positive gram stains blood cultures drawn for bacteremia between August 11, 2020 to October 31, 2020. protocol implantation data will be compared to Pre-protocol implementation data (collected January 1 2019 to August 31 2019) and Pre-RDT implementation data (July 1 2018 to December 31 2018). The primary endpoint of this study will be days of therapy of vancomycin of protocol vs pre-protocol patients.

Results: Results pending data collection.

Conclusion/Implications: Sutter Eden has one of the higher uses of vancomycin in all of the Sutter affiliates. There is a significant drug cost associated with vancomycin usage: pharmacist time, drug associated costs, and risk of vancomycin toxicities. If the implemented protocol is effective in decreasing vancomycin usage, it can be implemented on a larger scale to other Sutter sites. Future studies can examine look at pharmacist driven anti-microbial stewardship of other antibiotics.

Ability of *Pseudomonas aeruginosa* to modulate the anti-Staphyloccocal pharmacodynamics of linezolid

Authors:

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Introduction: *Staphylococcus aureus* (SA) and *Pseudomonas aeruginosa* (PA) are pathogens that are commonly co-cultured together from polymicrobial wound infections. The aim of this study was to assess whether PA is able to shield SA from exposure to the clinically relevant drug linezolid.

Methods: We evaluated the activity of linezolid against three SA isolates (MSSA1, MSSA2, and COL) alone and during co-culture with one of two clinical PA isolates (PA1 and PA2). Time-killing experiments were conducted using an inoculum of ~10^6 CFU/ml of organism. Linezolid concentration of 0.0039, 0.016, 0.063, 0.25, 1.0, 4.0, 16, and 64 mg/L were evaluated over 24 hours. At 0, 2, 4, 6, 8, and 24 hours, samples were collected from each reaction vessel, serially diluted, plated onto selective agar, and colonies were enumerated after 24 hours of incubation.

Results: During monoculture, 4 mg/L of linezolid reduced the density of COL by 0.66 $\log_{10}$CFU/ml and was the lowest concentration capable of sustained killing by 24 hours. During co-culture with PA, the same linezolid concentration was only able to achieve a 0.19 $\log_{10}$CFU/ml reduction (PA2) or slight growth of the COL (PA1). Against MSSA1 alone, 4 mg/L of linezolid achieved a reduction of 1.49 $\log_{10}$CFU/ml, whereas the same concentration resulted in growth of the MSSA1 by 0.31 $\log_{10}$CFU/ml or a reduction of 0.73 $\log_{10}$CFU/ml during co-culture with PA1 or PA2, respectively. Consistent with the other SA isolates, 4 mg/L was the lowest concentration of linezolid that reduced the density of MSSA2 at 24 hours when the organism was investigated alone (0.36 $\log_{10}$CFU/ml reduction), whereas 4 mg/L of linezolid resulted in the growth of MSSA2 at 24 hours when cultured with PA1 (0.77 $\log_{10}$CFU/ml increase) or PA2 (0.56 $\log_{10}$CFU/ml increase).

Conclusions/Implications: These preliminary results suggest that PA may be capable of attenuating the anti-staphylococcal activity of linezolid.

The Impact of Empiric Antibiotics Use in COVID-19 Patients: A Retrospective Cohort Study

Authors:
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Introduction: Antibiotic overuse during the COVID-19 pandemic is increasingly being reported, despite infrequent bacterial co-infection. Empiric antibiotic indication and timing remains in question, which highlights a need for studies that can guide judicious antimicrobial prescribing and antimicrobial stewardship strategies. The objectives of this study are to describe the prevalence and selection of empiric antibiotic use for pneumonia in COVID-19 patients, determine the rate of bacterial coinfection, and assess the clinical outcomes of COVID-19 patients receiving empiric antibiotics for pneumonia.

Methods: We conduct a retrospective, institutional review board-approved, multicentered cohort study of COVID-19 patients aged 18 and older with diagnosis of pneumonia between July 1st 2020 and September 31st 2020. Patients who were on active antibiotics prior to admission or transitioned to comfort care within 5 days of hospitalization were excluded. Patients will be matched according to their baseline characteristics and categorized into either the ICU or the Floor cohort. Each cohort will then be stratified based on their antibiotic exposure status (exposed vs. not exposed) and duration of antibiotic therapy (>5 days vs. ≤5 days). The proportion of each group will be reported using descriptive statistics, and their outcomes will be compared using statistical analysis.

Results: Empiric antibiotics for pneumonia and duration of therapy, along with microbiological results and oxygen requirements will be recorded for approximately 650 patients. Clinical outcomes of those receiving empiric antibiotics will be compared to those who did not or received shorter course of antibiotics. Clinical outcomes to examine include hospital length of stay, treatment complications such as ICU admission and antibiotics-induced adverse events such as *Clostridium Difficile* infection.

Conclusion/Implications: Very limited studies have investigated the impact of excessive antibiotic use on health outcomes of hospitalized COVID-19 patients. This study will address this gap in evidence and provide insight on antibiotic prescribing in COVID-19 patients.

Various Point-mutations in the CCR5 Gene Cause Decrease in Its Activity as Co-receptor in HIV Infection.

Authors:

Mary Jabari (presenter), California NorthState University, College of Graduate Studies, MPS student.

Advisor: Dr. Ghalib Alkhatib, Department of Basic Sciences, California NorthState University, College of Medicine.

Introduction: Human immunodeficiency virus (HIV) is a virus that attacks the body's immune system. HIV leads to acquired immunodeficiency syndrome (AIDS) if left untreated, which has no cure yet. The CC chemokine receptor 5 (CCR5) is a transmembrane protein that is found on the surface of white blood cells and is used as a co-receptor by the HIV to infect cells. The CCR5 gene was first identified in 1977 but did not become a subject of great public interest until 2009, when an HIV positive individual transplanted with bone marrow from a donor with a homozygous *CCR5*-Δ32 mutation, became HIV negative despite stopping anti-retroviral (ARV) therapy. This seminal clinical case study was founded on decades of work showing the role of CCR5 as a co-stimulator in T-cell function, activation, and the production of antigen specific T-cells. These studies showed the *CCR5*-Δ32 mutation to cause deletion of 32-base pairs in *CCR5*, leading to non-functional expression of this gene that does not localize to the cell surface. These mechanistic findings along with the discovery of CCR5 as a necessary co-receptor for entry of macrophage tropic HIV strains led to increased interest in this gene as a target for HIV treatment and other immunological processes.

Recent studies reported some point mutations in the CCR5 gene isolated from HIV seropositive patients. The reported point mutations were unique and different from those observed in HIV seronegative individuals. In this study we generated point mutations that correspond to those reported in HIV+ and HIV- individuals. The mutations were expressed using a reporter gene activation assay that specifically detects CCR5 coreceptor function. Our results showed that CCR5 mutants that correspond to those naturally isolated from HIV+ patients had lower CCR5 coreceptor function. In contrast, mutations that correspond to those isolated form HIV- individuals had comparable CCR5 coreceptor function to the wild type CCR5.

Experiments are underway to analyze the cell surface expression of these mutants to elucidate the mechanism of reduced CCR5 coreceptor function.

A *Pseudo*-Understanding of Chronic Wound Infections

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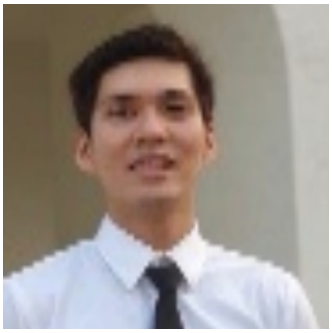
Dr. Justin Lenhard, Department of Clinical and Administrative Sciences, College of Pharmacy, California Northstate University.



Introduction: Chronic wounds consists of arterial, diabetic, pressure, venous, and post-surgical wounds, which do not heal over an expected time frame and eventually develop into chronic ulcers. It is generally expected that *Staphylococcus* species are most often seen from isolated cultures of chronic wounds regardless of infection status. However, there have been reports of *Pseudomonas aeruginosa* being the predominant species, especially in warmer climate regions of the world. The purpose of this study is to thoroughly review scientific literature on the prevalence and impact of *Pseudomonas aeruginosa* in chronic wound, with focus on diabetic foot infections.

Methods: To investigate the microbiota of chronic wounds and prevalence of *Pseudomonas aeruginosa*, a comprehensive search was performed on PubMed database, using specific search terms. Original articles published from 2005 to 2020, and containing the following information were selected: epidemiology, prevalence, swabbing techniques, culture identification techniques, and clinical outcomes.

Results: From all the populated search results, 79 studies met the inclusion criteria. All relevant information regarding the composition of microorganisms found in chronic wounds and diabetic foot ulcers were reported. Trials comparing microorganism's identification techniques and outcomes associated with isolation of *Pseudomonas aeruginosa* from wound cultures were summarized.

Conclusion: *Pseudomonas aeruginosa* was among the most prevalent microorganisms found in chronic wounds, including diabetic foot ulcers. The bacteria is more common in countries with tropical climate. Swabbing techniques such as Z-line and Levine were comparable to tissue culturing in detecting common pathogens found in chronic wounds. *Pseudomonas aeruginosa* is found to be associated with wound size, healing rate, and longer wound duration in chronic wounds. In diabetic foot infections, the role of *Pseudomonas aeruginosa* is unclear, and more studies are needed to fully elucidate the impact of this microorganisms.

COVID-19 Vaccine: What We Know and What We Need to Know as Caregivers

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The coronavirus disease 2019 (COVID-19) pandemic caused by severe acute respiratory syndrome coronavirus (SARS-CoV2) poses a serious threat to human health. This virus causes serious respiratory illnesses, such as pneumonia and lung failure, and has led to enormous human casualties and economic loss. Despite sanitary preventions and guidelines proposed by the CDC to stagger the spread of COVID-19, there have been over 19 million confirmed cases with over 300,000 being deaths reported in the United States. The global impact of the COVID-19 pandemic is driving next-generation vaccine technology platforms through accelerated development. By mid-December 2020, more than 200 vaccines from various pharmaceutical companies entered preclinical development with 64 vaccine candidates currently in clinical trials on humans. There are 4 major types of vaccines in development: mRNA, protein subunit, viral vector, and conventional inactivated virus vaccines. Currently, two mRNA-based vaccines have been authorized and recommended for emergency use in the United States: Pfizer-BioNTech vaccine BNT16262 with a vaccine efficacy rate of 95% and Moderna's vaccine mRNA-1273 with a vaccine efficacy rate of 94.1%. Both vaccines target the Spike protein of SARS-CoV-2 to block entry of SARS-CoV-2 into human cells. As of December 28, 2020, three additional COVID-19 vaccine candidates are in large scale (Phase III) trials. The two FDA-approved mRNA-based vaccines require two doses intramuscularly and low temperature storage. This review summarizes the current knowledge of the design and efficacy profiles of the Pfizer-BioNTech COVID-19 and Moderna COVID-19 vaccines and things that we need to know as healthcare providers. In addition, we will discuss the future perspective of other vaccines currently in phase 3 clinical trials.

Exploring the Reactions of the Community on Using Hydroxychloroquine for COVID-19 Treatment: A Perspective from Social Network Users

Authors: Tuan Tran (presenter), Department of Clinical and Administrative Sciences, College of Pharmacy, California Northstate University, Thuy Do, University of Massachusetts, Boston, Uyen Le, Department of Pharmaceutical and Biomedical Sciences, College of Pharmacy, California Northstate University, Dong Nguyen, CEO Saolasoft Inc.

Introduction: Hydroxychloroquine is used to prevent or treat malaria caused by mosquito bites. Recently, the drug has been suggested to treat COVID-19 that has not been supported by scientific evidence. The misinformation regarding the drug treatment has flooded social networks, e.g., Twitter, that potentially posts threats to community and public health. This study explores the reactions of social network users and their potential misuse of the drug on the misinformation triggered by influencers on social media by analyzing the frequencies and sentiment of the tweets posted by the users on Twitter.

Methods: Influencers are defined as the users in social media with thousands of millions of followers. In this study, we explore the impact of misinformation disseminated by the influencers to their followers using the case study of Hydroxychloroquine. We developed a program that collected more than 20,000 tweets associated with Hydroxychloroquine discussions on Twitter from February 2020 to September 2020. The collected data is then analyzed by using a text mining approach to extract the frequencies and sentiment of the tweets to reveal the reactions and opinions of users in the time and space domains. We also compared the tweet and keyword search frequencies in the Google search platform to identify the reaction and interest pattern of the drug over time. The tweet frequencies are also mapped to the geographical location of the states of the U.S to reveals how misinformation is disseminated in the space domain. The geographically mapped data can be used to show the impact of an external bond (e.g., political association) on enhancing the support of misinformation.

Results: The visualization of the number of tweets in the time domain shows a strong association of the tweet frequencies and reactions on social media triggering by misinformation sent out by an influencer. Our data shows that many social network users advocate for the use of Hydroxychloroquine for treating COVID-19 even though the information was not supported by scientific evidence. Our analysis also shows that there is a strong correlation between the tweet and the Google keyword search frequencies. This reveals the spread of misinformation from the social media platform to showing interest in using the drug for an unverified treatment. The geographical mapping of the data across the states of the U.S. also shows that followers who share other interests with the influencer (e.g., political support) react more to the misinformation compared to the others.

Conclusion/Implications: Using the case study of Hydroxychloroquine, our findings suggested that misinformation can reach far and get a lot of attention on social networks even though it may not be aligned well with the scientific evidence. This poses significant threats to public health if the influencer purposely sends out misinformation to the followers. Public health policymakers

should be aware of the risk and utilize the tool to proactively warn the community to avoid incidents.

Track 3
Clinical Practice, Management, Simulation, and Well-being
(Track 3 - Teams Link)

Comparing Intubation Airway Barrier Devices Using a Simulated Airway Task Trainer

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Advisor: Nur-Ain Nadir, MD, MHPE, FACEP, Emergency Medicine, Kaiser Permanente, Modesto Medical Offices.

Introduction:
With the lack of FDA-approved protection barriers and inadequate access to PPE during the SARS-CoV2 pandemic, clinicians have been compelled to improvise protective barriers during aerosol-generating procedures (AGPs). In this study, we compare three different airway barrier devices made from plastic drapes, PVC, or fiberglass using a simulated airway task trainer.

Methods:
Anesthesia and Emergency Medicine faculty participated in training sessions with devices made from plastic drapes, PVC, or fiberglass. Time to device setup, first pass intubation, and first bag mask ventilation were calculated. The average times were compared for each barrier setup for 10 experienced airway practitioners. Participant feedback was transcribed detailing the unique experiences with each device. Four weeks after the training a survey was circulated to compare the utility of each barrier device setup.

Results:
Of the 67 total participants, 60% felt more comfortable with direct laryngoscopy (DL) while 97% preferred the indirect or video laryngoscopy (VL) intervention for COVID-19 positive or Patient Under Investigation (PUI) patients. Respondents generally preferred a plain clear plastic drape or clear plastic drape with the PVC cube for both DL and VL set up. Another 40% of respondents indicated that performance of VL or DL was perceived to be more difficult with the rigid fiberglass box. There was no statistically significant difference between time to setup for each barrier device. Survey indicated a preference for the PVC cube with drape, the clear plastic drape for indirect laryngoscopy, and the clear fiberglass box for DL. The preference for DL and the clear fiberglass box correlates with participants who did not traditionally train with VL.

Conclusion/Implications:
With minimal training, a majority of clinicians prefer straightforward, clear-plastic drapes for addressing airway concerns. This information will help guide recommendations on usage of barrier devices during AGPs in COVID-19 patients and can be applied in training future HCPs to perform emergent intubations in high stress situations.

Prevalence and Comparison of Potentially Inappropriate Medication Use in Elderly over an 8-year Period

Authors:

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Advisor: Eugene Kreys, Clinical and Administrative Sciences, California Northstate University College of Pharmacy.

Introduction: The purpose of this study was to determine the rate, frequency, and characteristics of elderly patients being prescribed potentially inappropriate medications (PIM).

Methods: Data from the National Ambulatory Medical Care Survey years 2008-2015 was used to perform a cross-sectional study of outpatient ambulatory visits of people ≥65 years in the United States. Primary endpoints included the rate and frequency of PIM prescribing as defined by the 2012 Beers criteria. Secondary endpoints determined patient risk factors to receiving PIMs, and PIM rates pre- and post- criteria update. Subjects were designated into two cohorts: an unqualified cohort where PIM rate was determined independent of diagnosis and a qualified cohort where PIM rate was determined in the context of qualifying disease states. Statistical analysis was performed using IBM SPSS version 26.

Results: Of 2.1 billion ambulatory visits between 2008-2015 for patients ≥65 years, 611 million (28.9%) reported at least one PIM. The unqualified cohort highest prevalence PIMs included benzodiazepines (7.3%), and non-COX-selective NSAIDs (6.6%). The qualified cohort highest prevalence PIMs were benzodiazepine use in patients with insomnia or delirium (24.3%), and antiarrhythmic use in patients with atrial fibrillation (16.1%). Significant risk factors to receive PIMs were found to be depression with an odds ratio (OR) of 2.06 ((95% CI):1.90-2.23), CHF [OR 1.60 (1.42-1.81)], and male sex [OR 0.84 (0.80-0.89)]. Statistically significant rates comparing years 2008-2011 to 2012-2015 saw decreases in nearly all PIM use except general use of non-COX-selective NSAIDs [OR 1.18 (1.04-1.33)] and antimuscarinic use in patients with constipation [OR 2.83 (1.67-4.80)], respectively for years 2012-2015.

Conclusion/Implications: The prevalence of PIM use is high in elderly patients, at 28.9%. Older adults with qualifying chronic disease states were found to have higher rates and odds of being prescribed a PIM, and these subjects may warrant additional attention from a policy perspective.

Effects of Physical Activity on The Mechanisms of Sleep

Authors:

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Advisor: Dr. Jason Lillis, California Northstate University.

Introduction: The expectation that exercise will benefit sleep can partly be attributed to traditional hypotheses that sleep serves energy conservation, body restoration, or thermoregulatory functions, all of which have guided much of the research in this field. Research has shown that sleep disturbances could possibly impair a person's cognitive performance or capacity for exercise and increase the risk of exercise-induced injuries.

Methods: Our population includes 15,701 observations. The cohort has been followed into young adulthood with four in-home interviews when the sample was aged 24-32. Survey data were collected using a 90-minute CAPI/CASI instrument. Following the interview, interviewers took physical measurements and collected biological specimens and a medication log. This research design took a closer look at their general health and diet, sleep patterns, and daily activity.

Results: After adjusting for the potential confounding factor of, t*ime of day you had vigorous activity in the past 24 hours*, general health was significantly associated with the likelihood of snoring/stops in breathing, such that those who did engage in vigorous activity were about 1.7 times more likely to snore/stop breathing leading to poor sleep hygiene. This contradicts our original hypothesis, yet still fields significance for the opposite conclusion.

Conclusion/Implications: These findings will fill any gaps that researchers may have left when studying the effects of exercise on sleep. Despite a large number of studies conducted on sleep and exercise, researchers have not come to a conclusion on the impacts each variable has on the other. These findings may open doors for researchers to dive deeper into the bodily mechanisms impacted when we engage in physical activity. Future advances in technology will also aid research.

The Application of Cognitive Flexibility Theory to Resolve the Inherent Ill-Structuredness of IPE

Authors:

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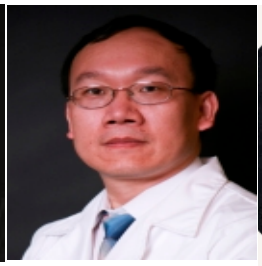


Introduction. IPE is challenging to implement and assess due to barriers preventing interprofessional communication, inadequately defined accreditation criteria, and the inherently ill-structured educational construct of IPE.

Methods. To address these gaps, a novel comprehensive, integrated, and multimodal IPE (CIM-IPE) curriculum involving students from pharmacy, medicine, and psychology doctoral professional degree programs and nursing students was created. The curriculum for CIM-IPE was carefully designed based on cognitive flexibility theory (CFT) to solve the complexities associated with teaching and learning for an ill-structured educational domain such as IPE. CFT emphasizes pluralistic representation, repetition, and cognitive layering in experiential learning for ill-structured domains. Thus, CIM-IPE was vertically and horizontally aligned within individual colleges and included diverse IPE experiences in required courses such as Foundations of IPE, and high-fidelity simulation events, culminating in an IPE-Hotspotting elective, which exposed learners to real-world patient cases. Cases were presented in a format of increasing complexity emphasizing the integration of foundational and skills-based learning using constructivist methods such as Team-Based and Case-Based Learning. CIM-IPE offers a novel IPE model. Here we present a stepwise development and implementation blueprint for similar IPE programs that is readily transferable to other health professions education (HPE) programs.

Results. A significant developmental hurdle in an IPE curriculum is the creation of meaningful interprofessional cases closely resembling real-life scenarios. The CNU-IPE Committee resolved this problem by applying CFT to CIM-IPE. Questions in planning the CIM-IPE model included what type of teaching and learning model of IPE to be implemented, the curricular placement of each IPE event, student body characteristics such as which profession and how many students would be engaged at each stage, and the development of a specific case with well-defined learning objectives.

Conclusion. Transfer of the CIM-IPE model to other HPE programs necessitates an inclusive and integrated organizational, cultural, and administrative architecture.

A First Report of HCTZ and Dicyclomine Induced Uncharacteristic Contraction Alkalosis

Authors: Tony Eid[1], Janie M. Yu[2], Elizabeth A. Browning[3], Matthew Horton[4], Ashim Malhotra[5*]

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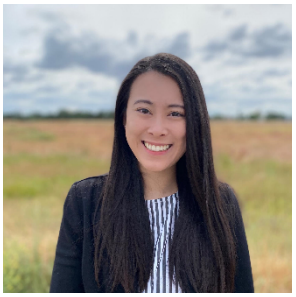

Introduction. Contraction alkalosis is characterized by low serum sodium and chloride and high serum carbon dioxide and bicarbonate levels.

Methods. A 28-year-old Caucasian Active-Duty male with a history of autosomal dominant polycystic kidney disease and diarrhea-predominant Irritable Bowel Syndrome (D-IBS) presented to his primary care provider (PCP) with elevated blood pressure (136/96 mmHg). He was diagnosed with stage-2 hypertension and started oral HCTZ (25 mg/day). His medications included dicyclomine (10 mg oral three times daily). Later at the pharmacist-led clinic, (Visit 1), his blood pressure was 130/91 mmHg and he was started on telmisartan (20 mg/day). At Visit 2, four weeks later, the patient showed improvement (121/73 mmHg). However, blood chemistry revealed elevated serum carbon dioxide (32 mEq/L) and chloride (94 mmol/L). Four days later, the patient presented to the Emergency Department with dyspnea and swallowing difficulty.

Results. The patient returned to his PCP 3 days later complaining of cough, congestion, vomiting, and mild dyspnea. His blood pressure was 124/84 mmHg on HCTZ and telmisartan. Two months later, he reported the sudden onset of projectile vomiting and abdominal pain while running. He was given supportive care including rehydration and a single oral dose of prochlorperazine 25 mg. Three months later, (Visit 3), he complained of lightheadedness and cloudy judgment. He was diagnosed with contraction alkalosis. Hydrochlorothiazide was discontinued and telmisartan was increased to 20 mg twice daily for antihypertensive benefit. Follow up blood chemistry panel two weeks later revealed serum chloride and CO2 levels within normal limits and follow up ambulatory blood pressure monitoring indicated blood pressure at goal (under 130/80mmHg). The patient reported resolution of lightheadedness and cloudy judgment.

Conclusion. This is the first known report of contraction alkalosis driven by drug-drug interaction between dicyclomine and HCTZ.

Intimate Partner Violence (IPV): What Are the Physiological and Psychological Consequences?

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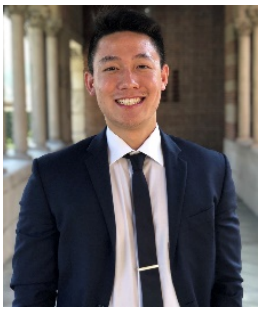

Introduction: A literature review was conducted on the impacts of intimate partner violence (IPV) specifically on the physiological and psychological implications. Intimate partner violence is defined as any physical, sexual, or psychological harm caused by a current or former intimate partner or spouse. This type of violence can occur among heterosexual or same-sex couples. The intersection between IPV and STI centers around the fact that individuals with increased rates of IPV are often the same individuals at risk for STI and HIV: young women, minority women, and women of limited means and low socioeconomic status As per the severity of the violence, IPV can be classified into 4 levels: Level I abuse grabbing, shoving, pushing, throwing objects to intimidate, Level II abuse: kicking, biting, and slapping, Level III abuse: use of a weapon, choking, or attempt to strangulate, and Level IV: psychological abuse. With recent research in understanding the detrimental effects of IPV, this research emphasizes how to prevent and take appropriate measures for IPV victims.

Methods: By focusing on research-based methods, this study seeks to find a holistic impact on STI, HIV, and mental health providence for all individuals in a vulnerable position from intimate partner violence. Methods involved applying a cross-sectional survey as a baseline assessment for the intervention study to examine the associations of recent IPV with risk behavior.

Results: Psychological implications within IPV have been acknowledged as being linked to disability, poor mental health, and impaired quality of life. A prevalence of physical or sexual IPV was associated with recent drug-related STI/HIV risk.

Conclusion/Implications: The implications of this research is designed to help discuss the physiological and psychological implications of intimate partner violence including STI/HIV and mental health by broadening clinical risk assessments to include unprotected anal sex, coercive sexual risk, and mental stability assessments; put forth efforts in the need to focus on the promotion of partner notification in relationships; and explain the IPV and sexual health implications associated with inconsistent condom use, partner non-monogamy, and unplanned pregnancy.

Are Relationships Good for your Mental Health?

Authors: Lauren Ihle, California Northstate University College of Psychology.

Introduction: The purpose of the study was do see how relationships affect mental health. The related background information that has been found is that depressive symptoms have been noted to be an antecedent and consequence due to relationship issues and conflict (Mackinnon, et al. 2012). Also, stress has impacted men and women differently within a heterosexual relationship (Crenshaw, et al. 2019) and can have varying effects depending on the stressor and intensity (Randall and Bodenmann, 2009).

Methods: AddHealth was used to collect data. AddHealth is a national longitudinal study of a represented sample of adolescents (grade 7-12). Participants were assessed during different waves of time, and I used Wave IV in my research which had a total of 12,157 number of participants assessed from the original 20,745 people.

Results: There was a statistically significant correlation between perceived stress and relationship dissatisfaction which suggests about 9.4% of the variance in relationship dissatisfaction is explained by stress. Secondly, biological sex showed similar correlations. Provide a summary of key findings consisting of sufficient details to support the conclusions. Also, those who report not at all committed to a relationship reported higher levels of depression than those in committed and very committed relationships.

Conclusion/Implications: Relationships relate to mental health in various ways. Perceived stress is associated with relationship dissatisfaction for both men and women. For the future, I would like to have a wider variety of relationships and knowing the history of those in the study (mental health, relationships, etc.)

Comparing Efficacy of Intravenous Diazepam Versus Intravenous Lorazepam in Alcohol Withdrawal

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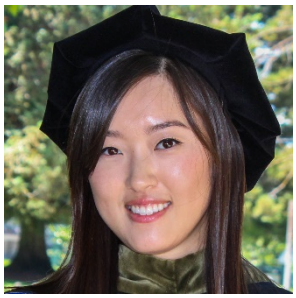
Advisor: Justin Roth, Pharm.D., BCPS, BCCCP, Alta Bates Summit Medical Center.



Introduction: Alcohol is a commonly abused substance in the United States. Long-term use is associated with withdrawals, leading to complications such as seizures and death. Benzodiazepines are one of the mainstay treatments for alcohol withdrawal; however, there is no clear evidence suggesting the use of one benzodiazepine over another. Lorazepam has been commonly used due to its shorter elimination half-life, which is thought to reduce the risk of over-sedation. However, early studies have demonstrated a potential advantage of diazepam when used in alcohol withdrawal. The rapid onset of Diazepam allows for quicker evaluation of its maximum peak effect and allows clinicians to more accurately assess the need for additional doses with lower risk of over-sedation. The primary objective of this study is to compare the clinical efficacy of IV diazepam versus IV lorazepam in alcohol withdrawal.

Methods: This retrospective study will be conducted utilizing data from the EHR of Sutter Alta Bates Summit. The study cohort will include adults who received the first dose of either IV diazepam or IV lorazepam with a diagnosis of alcohol withdrawal, between January 1st, 2017 and September 15, 2020. Primary outcome will measure time to benzodiazepine dose after initial intravenous dose. Secondary outcomes will include incidence of breakthrough seizures, incidence of intubation, length of stay in the ED, overall length of hospitalization, adjunctive use of non-benzodiazepine based therapy, ICU admissions, time from first IV benzodiazepine dose to rescue therapy.

Results: Pending

Conclusion/Implications: This study may provide insights on whether the pharmacokinetic properties of diazepam may be advantageous in the setting of alcohol withdrawal to lead to decreased rates of subsequent doses of benzodiazepines, while effectively controlling withdrawal-related symptoms. With quicker resolution of symptoms and less doses required to achieve resolution, this may transpire to reduced hospitalization rates with improved outcomes for patients.

The CNUCOP Management, Policy and Leadership (MPL) Program

Authors:

Peter Tenerelli, PharmBS, EMP, Suzannne Clark, PharmBS, PhD, Eugene Kreys, PharmD, PhD.

Introduction: Healthcare is changing at an ever-increasing pace. These changes have impacted pharmacy in positive and negative directions. To drive future changes in positive directions, pharmacists and PharmD students must develop and use effective management and leadership skills to advocate for the profession, and thus positively influence policies and regulations that impact pharmacy. To address this issue, the California Northstate University College of Pharmacy (CNUCOP) Center for Advanced Pharmacy Practice (CAPP) has developed the Management, Policy and Leadership (MPL) program for PharmD students. The MPL aims to provide students with exposure to, knowledge of, engagement with, and creation of outcomes related to MPL and advocacy.

Methods: In early 2020, PharmD students were invited to join the MPL. A survey was administered to assess students' MPL-related knowledge and experiences. Through a series of meetings, workshops, and readings, students were introduced to MPL topics. They also received guidance regarding projects with tangible outcomes.

Results: Twenty students joined the program and took the survey. Five program meetings were held; topics included (1) California State legislative bills impacting pharmacy, (2) opportunities by which students can gain advocacy training and experience through their local and state professional organizations, and (3) MPL certification. Students also were encouraged to attend parallel programs, such as the Capital Leadership Forum, during which they actively engaged with Forum speakers. Three MPL students sought and gained regional and state leadership positions, including CPhA student trustee for the state and a newly created position: SVPhA Board of Directors student member. Other outcomes include student-lead presentations, posters, articles, and certificates. A post-project survey will be administered to students who attended the programs, including those who complete a certificate.

Conclusions/Implications: The MPL program has potential to increase student engagement, leadership, and grassroots advocacy programs, thus taking advantage of being in the Capitol region.

Acknowledgement: This program was supported by a CNU ITLE 2020 HEGA grant (Tenerelli, Clark, and Kreys et al., 2020)

Naloxone Furnishing Within Different Counties of California

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Advisor: Valerie Gerriets, College of Medicine, California Northstate University.

Purpose: Naloxone is administered to reverse the effects of opioid overdose. We will investigate several variables to understand how/why we see differences in naloxone availability to gain greater insight into availability and barriers impacting the opioid epidemic. As we expand our research to urban and rural areas, we expect to see a greater amount of pharmacies stock naloxone in San Francisco county versus Sonoma county due to higher populace and implemented legislation.

Methods: A list of pharmacies was obtained from the California State Board of Pharmacy. A phone survey was administered to pharmacists and pharmacy technicians to geographically assess and analyze naloxone availability in Sacramento county. This phone survey will be expanded to other counties.

Summary: Of all pharmacies contacted thus far, only 44% of pharmacies had naloxone availability in 2018. Of those pharmacies 75% carried Narcan©, 17.9% carried intramuscular injections, 3.6% carried Evzio©, and 3.6% carried intranasal via atomizer. One pharmacy was found to carry all 4 formulations, and 49% of pharmacies surveyed furnished naloxone without a prescription. In 2019, we saw an increase in stocking naloxone as 98% of surveyed pharmacies carrying it with 86% of those pharmacies only carrying Narcan©. Naloxone furnishing without a prescription in 2019 jumped to 76%.

Conclusions: In the surveyed areas, more than 50% of pharmacies provide an indirect barrier by not carrying naloxone in 2018. Roughly 50% of pharmacies surveyed adhere to voluntary guidelines aimed to increase naloxone availability and limit barriers to access. When resurveyed in 2019, 98% were found to carry Naloxone and pharmacies that furnishing without a prescription increased to 76%. More pharmacies that stock naloxone were willing to furnish without prescription boosting protocol adherence and lowering barriers to availability. A notable jump was seen in protocol adherence and naloxone training when resurveyed with a 40% increase in training.

Outcomes of Pharmacist-implemented Opioid Stewardship Program at AHWM.

Authors:

Sukhawadee Anussornrajkit, PharmD.

Thao Nguyen, PharmD., Director of Pharmacy at Adventist Health White Memorial

Introduction: Opioid analgesics range among drugs that are most frequently associated with adverse events including hospitalization and cause of deaths. In 2018, according to Central Disease Center, the number of drug overdose deaths remain high, and about 70% of these deaths involved opioids.

The Joint Commission (JC) revised the assessment and management standards in 2018 for the Joint Commission-accredited institutions. The new standards require hospitals to identify pain assessment, including safe opioid prescribing, manage the patient's pain and minimize the risks associated with treatment.

Since pharmacist roles have become more clinical focus at AHWM, pharmacists are an important key to monitor for an appropriate opioid dosages and treatment both in patients and before discharge to reduce number of deaths and better this opioid pandemic.

Methods: This pain management program will screen for two types of patients: patients with severe pain (pain scale above 7) and patients at high risk of respiratory depression (2 or more incidents of respiratory rate < 14 breaths per minute or hypoxia (spO2 < 92%) over 24 hours period). APPE students and/or interns will help screen the patients who meet the criteria. A pharmacist will review the screenings and attend the pain management rounds with the pain specialists approximately three times a week to review and optimize patient pain regimens. Each round will occur for about thirty minutes.

Inclusions are patients age > 18 years old or pain medications with 3 or more pain scores over 7-10 over 24-hour period and/or more incidents of respiratory rate < 14 breaths/min over 24-hour period.

The primary outcomes of this study will be the reported lower pain scores. The secondary endpoints will be the reduction in incidents of respiratory depression, the reduction in Morphine Milligram Equivalence (MME), and patient- pain- satisfactory.

Results: The results of this study will be presented at Western State Conference.

Conclusion/Implications: Findings of this study will determine whether pharmacist engagement in pain management is effective and improve the outcomes of patients.

Is Dispositional Optimism Associated with Subjective Physical Health Across Demographics?

Authors: David Giard, College of Psychology, California Northstate University.

Introduction: Quality of physical health is associated with increased longevity and decreased societal and individual costs. In previous literature, dispositional optimism has been shown to improve physical health, both subjectively and objectively. Differences in demographics have mainly not been studied. Understanding the generalizability of research into dispositional optimism could help develop future interventions designed to cultivate dispositional optimism, resulting in increased quality of life, increased longevity, and decreased individual and societal costs of healthcare.

Methods: Data used came from the fourth wave of the National Longitudinal Study of Adolescent Health (AddHealth). N=5114. The first variable used is optimism, a secondary variable comprised of 4 questions taken from the LOT-R (Life Orientation Test, Revised). The response variable is subjective general health "In general, how is your health?" Demographic variables include biological sex, race and ethnicity, total household income, and the highest education level.

Results: Optimism is associated with subjective general health (p=<.001, *R*^2of .082). Results indicate that Optimism accounts for 8.2% of the variance in general health. Potential confounds such as biological sex, total household income, and the highest education level were found to have independent relationships with subjective health. Race and ethnicity were found to moderate the relationship between optimism and subjective health in some races.

Conclusion/Implications: Dispositional Optimism is associated with subjective measures of health. Demographic differences, including sex, age, household income, and the highest level of education, were independent predictors of subjective health. Race/Ethnicity was a moderator of dispositional optimism on subjective health in races including American Indian and "Other" races.

Future directions include examining this relationship in more extensive and more diverse groups. Restricted ages of participants precluded examining associations with biological health outcomes. Additionally, a longitudinal study could be created to examine changes over time.

Track 4

Educational Research and Informatics

(Track 4 - Teams Link)

Mixed Method Evaluation of a Virtual Pandemic Interdisciplinary Pre-Matriculation Program

Authors:

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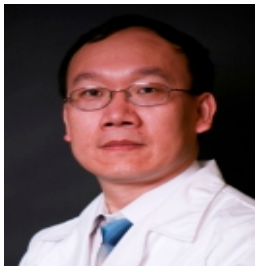

Introduction. COVID-19 vastly disrupted education across the globe, creating unique challenges for health professions education (HPE) programs, creating a need for long-term evaluation of teaching. Nowhere is this need more urgent than for curriculum associated with interprofessional pre-matriculation programs.

Methods. In 2020, we created an online pre-matriculation program by adding primers introducing interprofessional education, and cross-disciplinary and inter-disciplinary aspects related to pharmacy school and conducted a case-controlled, retrospective, single-blinded (blinded to the teaching faculty) study analysis through a comparison of learning metrics between 2019 and 2020. The two-week-long virtual program, co-taught by ten faculty members, was offered for six hours daily during the summer of 2020 in the week preceding orientation week for first professional year students in our Doctor of Pharmacy (PharmD) program. Case Based Learning and aspects of Team Based Learning were incorporated to engage twenty-two pre-matriculation students enrolled for our Doctor of Pharmacy program. This virtual program was designed to overcome diversity in pre-requisite course content and identify and address gaps in students' abilities to relate foundational science knowledge with pharmacy subjects. The following subjects were included: cardiovascular, neuro, and renal pathophysiology and pharmacology, and skills-based courses such as introduction to simulation, clinical decision making, interprofessional education, graduate writing. The third area we focused on included emotional and mental health and resiliency in the current pandemic. Mixed method evaluation was used including comparing student perceptions of their learning on a twenty-question survey instrument and comparison of the post-activity quiz data.

Results. Seventy-seven percent of the attending students from 2020 agreed and 22 percent strongly agreed that the virtual program helped them connect the dots between pathophysiology and pharmacology and pharmacology and skills-based courses such as interprofessional education.

Conclusion. The online pandemic pre-matriculation program was perceived by students to be helpful for reviewing content.

CNUCOP Certificate: Preparing Students for Experiential Training and Beyond the Didactic Curriculum

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Introduction: The CNUCOP certificate program provides College of Pharmacy students with the opportunity to gain necessary trainings to start their pharmacy career. Each certificate provides documentation of completion of acquired skills which will help the student be successful on rotations and a competitive applicant once graduated. Collaboration through external vendors has provided CNUCOP with opportunities for students to gain additional practical training beyond the didactic curriculum. Three areas of completion for the certificate program include: sterile compounding, evidence-based medicine, and pharmacy calculations. In addition to the certificate program, there are also certificates of participation which encompass many other areas of skills and knowledge needed by students on rotations. The purpose of this poster and program is to present the necessity and benefits of the certificate program toward the success of COP students while also expounding upon potential areas of research.

Methods: Students are scheduled to complete certifications before the end of their didactic curriculum and prior to introductory pharmacy practice experience and advance pharmacy practice experiences. Proper assignments, grading, and monitoring of rotation site requirements are reviewed periodically. Assurance that students are meeting proper training for their experiential requirements is assessed.

Results: Results will be based on current student perception of readiness and confidence level going into rotations. Preceptor feedback will assess performance of students that have completed the certificate program. Alumni reflection will provide an evaluation of the adequacy regarding current competency areas selected for certification.

Conclusion/Implications: The certificate program demonstrates areas of completion for an array of skills afforded to the COP students. By ensuring completion, students are set up for success on their future rotations. Research generated will potentially elucidate the need for certifications in other areas to assure COP students are competitive and prepared for their future rotation needs and potential career directions.

Medical Student Anxiety Levels and Help-Seeking Behavior

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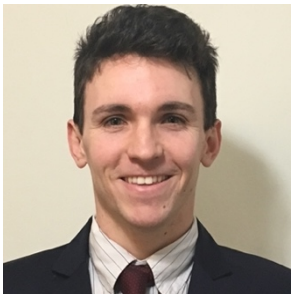

Introduction: There is limited knowledge of the care-seeking behavior in persons with anxiety, especially at the medical school level. With the considerable rigor and stress of medical school, we have sought to better understand how medical students seek to address high/moderate anxiety levels by quantifying the utilization of counseling services and wellness events in medical students experiencing anxiety. This abstract describes the project and its outcomes.

Methods: Well-being data has been collected over three years. A 20-minute online survey has been provided to all medical students at the California Northstate University COM biannually. The survey includes demographic data, wellness events attended, and whether the student has seen a mental healthcare provider over various intervals. The bulk of the data are in the form of a Likert scale, or ordinal values, testing for levels of anxiety, burnout, etc. The anxiety quantifier used in the survey is the GAD-7 scale, the most commonly used self-reporting scale for generalized anxiety disorder.

Results: 248 students have completed the survey. Of those who answered the survey, 21 of 248 students (8.47%) reported high/moderate anxiety, and 15 of 21 (71.4%) students with high/moderate anxiety attended either counseling or wellness events, with 9 of 21 (42.9%) seeking counseling and 10 of 21 (47.6%) attending wellness events. When isolating for help seeking in the form of attending wellness events, there is no statistically significant correlation with high/moderate anxiety level; however, there is a statistically significant correlation with attending counseling and high/moderate anxiety level.

Conclusion/Implications: Determining how mental health services at medical school are utilized by students to either maintain or improve anxiety can encourage more educational institutions to provide such resources for their students, as more than 70% of students with high/moderate anxiety utilized wellness resources.

Comparison of 3-year and 4-year Pharm.D. Programs

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Brian Wong, Kimberly Xiong, Peter Tenerelli RPh, Tiffany Kreys Pharm.D., BCPP.

Introduction: A three-year pharmacy program, compared to a four-year traditional pharmacy program, is an accelerated alternative that allow students to complete their pharmacy degree one year earlier. A major appeal of accelerated programs is the potential to begin earning an income one year earlier than those in traditional programs. However, there have been concerns that year-round classes limit the time students are able to participate in research and internships, which may be disadvantageous to students. In our study, we conducted a nationwide comparison between three-year and four-year pharmacy programs to determine differences in general characteristics and key outcomes.

Methods: This was a retrospective analysis of all three-and four-year PharmD programs. We analyzed publicly available data retrieved from AACP, ASHP, and PharmCAS. Variables retrieved for analysis included general characteristics such as class size, location, and institution type (private vs. public), as well as outcomes such as NAPLEX pass rates, on-time graduation rates, post-graduation employment rate, and residency match rate. We used a chi-square test for nominal outcomes and an independent student t-test for continuous outcomes.

Results/Conclusion: Three-year PharmD programs were more likely to be offered by private rather than public institutions. Class size and location were not significantly different between programs, though three-year programs tended to be located near the West and East Coast rather than the South or Midwest. No difference in on-time graduation or post-graduate employment rates were observed; however, four-year programs had significantly higher NAPLEX pass rates and residence match rates. Further analyses will be conducted, specifically a time-series analysis and multivariable analysis, to control for differences in school characteristics when evaluating outcomes.

Evaluation of Student Pharmacists' Ability to Measure Blood Pressure

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Introduction: Blood pressure (BP) measurement is an essential part of a patient's physical assessment exam. Most physicians, pharmacists and other providers are trained in BP measurement during their early education. Many older studies have shown that these providers do not become proficient to the level of mastery in measuring BP. The purpose of the study is to determine if current pharmacy students can accurately measure BP.

Methods: Researchers assessed student pharmacists' ability to measure BP, through a simulated patient encounter. California Northstate College of Pharmacy (CNUCOP) students were invited to participate. Demographic information are described using actual values, percentages, means, and performance scores. Data collected were examined using SPSS and summarized in tables.

Results: A total of 24 CNUCOP students were assessed. Student's planned specialty had little impact on their overall performances. Third year students were shown to have the greatest performance. No student demonstrated proficiency in all 21 skills. Students scored with at least 50% proficiency on nine of 12 criteria. Students who have a plan specialty in education scored the highest overall compared to other specialties. Comparative statistics will be presented.

Conclusion/Implications: In this small cohort of students, they were unable to proficiently master blood pressure measurement techniques regardless of year in school. Thus, suggesting overall need for a change within the teaching curriculum may be warranted. Study investigators recommend competency testing for blood pressure technique to be accessed periodically and should be continued throughout the curriculum to achieve a proficient level of blood pressure measurement techniques. Limitations of the study include small sample size (due to recent distance learning), limited numbers of students from each academic year and limited number of pharmacy schools assessed. Investigators plan to repeat the study with larger cohorts and multiple schools of pharmacy in the future when distancing requirements allow.

Use of Concept Mapping To Identify Expectations of Pharmacy Students Selecting Elective Courses

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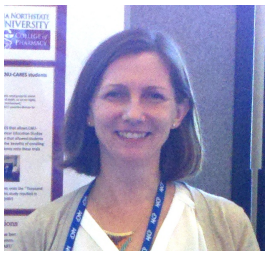

Introduction: The objective of this study was to demonstrate the use of concept mapping as a method for analyzing pharmacy students' qualitative perceptions of their expectations of elective courses and to thus help guide delivery methods and course content.

Methods: A survey containing demographic, Likert scale, and open-ended questions was administered to second-year pharmacy students prior to the start of elective courses and an innovative methodology, concept mapping, was used to identify major themes relating to student expectations. The association between preferred class delivery method (online versus in person) with student gender and English-as-a-second-language status (ESL) was also assessed. Note that this study was conducted prior to the COVID-19 pandemic.

Results: Ninety-eight out of 133 students (74%) completed the survey. Overall, 56% students stated that they preferred online delivery of courses (68% of these students were female, 36% were male). ESL status did not impact preference. The most common themes relating to student course expectations were the desire to learn about the elective course topic as well "real-world" utility.

Conclusion/Implications: Our combined data indicate that delivery method is a key factor contributing to students' choice of elective course and that concept mapping is an effective and efficient way to help identify student expectations of elective courses.

Student Pharmacists Promoting Awareness And Engagement In Advocacy for the Profession

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Introduction: To advance the profession, it is important for pharmacists and pharmacy students to be involved in grassroots advocacy to influence legislative bills and regulations. These advocacy skills can be learned by working within local, state and national professional organizations. This provides greater insight and understanding regarding the legislative process and the role of professional organizations in advocacy. This pilot student project is focused on promoting awareness and the role of advocacy in the legislative process.

Methods: First, to learn about California State bills that relate to pharmacy, we searched the website of California Pharmacy Associate (CPhA) and the California State Assembly website. We found three current bills that related to pharmacy. We then shared this information with our classmates (within CPhA, APhA, and members of the Management, Policy and Leadership (MPL) program). We followed the bill as it was discussed, passed, and implemented. CPhA reached out to members of the profession to promote passage of these bills, all of which impact the profession and healthcare access.

Results: We found three California bills that related to pharmacy (AB1710, SB-159, and SB-493). AB1710 addressed the COVID-19 vaccine and included provisions to allow pharmacists to administer the vaccine. SB-159 allowed pharmacists to initiate and furnish HIV pre-exposure medications (PEP & PrEP HIV medications). SB-493 noted that "...pharmacists are healthcare providers who have the authority to provide healthcare services" and allowed pharmacists to furnish contraceptive and nicotine replacement products, and furnish prescriptions for conditions that do not require a diagnosis for international travel. This bill set the stage for pharmacists' reimbursement by state agencies for these services.

Conclusions/Implications: Following the evolution of these bills, PharmD students can learn about the legislative process and see how grassroots advocacy impacts the profession and shows students how they can be engaged in advocacy for the profession.

Support Vector Machine Model for Predicting Breast Cancer Risk

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Introduction: Every year, there are about 276,480 women are diagnosed with invasive breast cancer in the United States. Early prediction of breast cancer plays a critical role in successful treatment and saving the lives of thousands of patients every year. Despite massive clinical data related to the patients are being collected and stored by healthcare organizations, only a small portion of the data has been used to support treatment decisions. In this study, we proposed an advanced machine learning method, support vector machine (SVM), to accurately predict breast cancer risk. The proposed method can achieve a prediction accuracy of 99% in the testing dataset. This study provides a new way for healthcare practitioners to effectively detect breast cancer for early treatment.

Methods: We used the well-known breast cancer dataset provided by the Wisconsin Breast Cancer Database. The dataset includes 11 attributes: ID, Clump_Thickness, Cell_Size, Cell_Shape, Adhesion, Epi_Cell_Size, Nuclei, Chromatin, Nucleoli, Mitoses, and Class. As the ID attribute is the random numbers assigned to the patients, we removed it from the modeling process. All other attributes (except the "Class" attribute) has values in the range from 1 to 10. The "Class" attribute is a categorical target variable of two categories: Benign (B) and Malignant (M). We first performed correlation analysis to identify highly correlated attributes. "Cell_Size" and "Cell_Shape" were correlated with a correlation coefficient of 0.91 (p-value < 0.001). As a result, "Cell_Size" was removed from our predictor list. Next, the remaining 9 attributes were used to construct a hyperplane for the SVM model to classify the target variable "Class". We used the well-known software packages "caret" and "kernlab" in R programming language to tune the parameters of the SVM model.

Results: We used prediction Accuracy (Acc), Sensitivity (Sen), and Specificity (Spe) as our performance metric for evaluation. "Acc" is defined as the ratio of the number of correctly classified cases to the total number of cases in our testing dataset. The higher Acc is the better. The proposed SVM model achieved an Acc of 99.30%. The proposed model also achieved a very high Sen of 97.92% and Spe of 100%. The model can classify all true negative cases correctly avoiding the burden of unnecessary diagnosis.

Conclusion/Implications: The proposed prediction model using advanced machine learning technique achieve high prediction accuracy, sensitivity, and specificity. It provides a new

approach for healthcare practitioners to accurately and effectively detect breast cancer risk for early treatment. We will further develop other machine learning models using neural networks or random forests in our future research.

Gaps between Teaching and Practice in Pharmaceutical Compounding: Currents, Expectations, and Solutions

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Introduction: Pharmaceutical compounding plays an important role in providing customized solutions for patient's needs when specific medications are not available on the market. Pharmacy educators have taken efforts to set up levels of competencies that students must possess after the completion of didactic coursework. However, there is insufficient data studying the proficiency upon transitioning from classroom/laboratory training to practice experiences. Therefore, our objective is to analyze the current teaching in pharmaceutical compounding, compare it to the requirements of practice experiences, and provide solutions to any deficiencies that the teaching is facing.

Methods: Our study identifies different key factors, including standards of practice in current pharmaceutical compounding operations, compounding curricula, gaps between teaching and practice, and finally providing of solutions for the gap filling. The USP Compounding Compendium is used as the platform of standard compounding guidelines. Compounding curriculum data is obtained from accredited colleges of pharmacy (COPs). Finally, three different surveys were conducted on randomly selected compounding pharmacies in California, CNUCOP APPE preceptors, and CNUCOP pharmacy students from class of 2020.

Results: The study shows that compounding curricula are varied among COPs in term of distribution and load. According to the response from surveyed compounding pharmacies, entry-leveled pharmacists are expected to comprehend the basis of calculations, USP guidelines (795, 797, and 800), verification of accurate prescription and label, and the compounding process. Both non-sterile and sterile compounding are valuated. Similarly, CNUCOP APPE preceptors stated that student skill in calculations is important besides training in compounding formulation. Interestingly, while ranking CNUCOP APPE students at a high level of competency in calculations (more than 80%), the preceptors have lower ranking in student's confidence (38%) at this skill. However, their evaluation on student compounding skills is not highly ranked. Student's response is matching with the preceptor' evaluation for the compounding skills.

Conclusion/Implications: The project is aiming to a consistent and standardized teaching program in pharmaceutical compounding for pharmacy students. This will help to prepare for a smooth transition from learning into practice, thus alleviating medication errors and ensure high-quality compounded products to patients.

Student Live Online Proctoring Tutorial for Synchronous Online Exam Sessions using Student's two Exam Taker Devices

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Introduction: Distance learning is introduced in IPP607 Fall to train and help P1 students adjust early in the curriculum. Online proctoring at CNUCOP to administer practice/qualifying exams were previously used by Dr. Mente as needed. Training and written instructions help address technology challenges with situations involving but not limited to: deterring cheating, potential background noise, technological issues, need for two devices with appropriate access, and potential for other distractions (i.e. children, household members, and pets).

Methods: During COVID-19 pandemic, students may take assessments by two methods: in-person for students interested in taking exams on campus or through a process developed and trained by Dr. Mente known as "online proctoring utilizing student's two devices" (laptop and mobile phone with camera). Mediasite recorded training video by Dr. Mente and student actress Kimberly residing on CANVAS PAGE was adopted by all CNUCOP during Fall 2020 since COVID.

Results: Over 850 people with @cnsu.edu email viewed training video on dual-device online proctoring. CNUCOP resumed courses online without disruption and administered quizzes, iRATs/tRATs/iBATs, midterms/final exams including P4 pre-qualifying exam. There are a number of advantages to consider. Students do not have to commute. This saves time and money on gas. Exams and quizzes can be taken virtually. It is convenient for students on rotation in far cities. Students can find comfortable space to take exams and avoid distractions. Also, students have less chance of being exposed to COVID, otherwise, they might have to reschedule exams if quarantined.

Conclusion/Implications: Our adoption as a pilot collegewide helped both faculty and students in all four classes. Process is simple and setup is easy to use. Schools can adopt in a short period of time as demonstrated by CNUCOP Faculty, Staff, Students, and Administration. It affords all students ability to stay at home and take assessments with online proctoring.