CALIFORNIA NORTHSTATE UNIVERSITY

Friday

MARCH 3RD

08:00 am to 04:30 pm

CALIFORNIA NORTHSTATE UNIVERSITY

# 2023 RESEARCH DAY

**Keynote Speaker**

Elena N. Dedkova DVM, PhD

Associate Professor of Physiology

California Northstate University, College of Medicine

**Student-Led Research**

**Poster & Podium Presentations**

**All are welcome!**

COLLEGE of MEDICINE | COLLEGE of PSYCHOLOGY | COLLEGE of PHARMACY | COLLEGE of DENTAL MEDICINE | COLLEGE of GRADUATE STUDIES | COLLEGE of HEALTH SCIENCES

## Research Day Schedule

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| **Poster Set-up** (P3 classroom, 2nd floor) | 8:00-8:45 |
| **Breakfast**: (MPS classroom, 2nd floor) | 8:00-8:45 |
| **Poster session A:** (P3 classroom, 2nd floor) | 8:45-10:00 |
| **College of Medicine** | |
| **College of Pharmacy** | |
| **College of Health Sciences** | |
| **College of Graduate Studies, Masters in Pharmaceutical Sciences** | |
| **College of Psychology** | |
| **Poster session B:** (P3 classroom, 2nd floor) | 10:15-11:30 |
| **College of Medicine** | |
| **College of Pharmacy** | |
| **College of Health Sciences** | |
| **College of Graduate Studies, Masters in Pharmaceutical Sciences** | |
| **College of Psychology** | |
| **Lunch** (COM classrooms, 1st floor) | 11:40-12:10 |
| **Keynote Speaker introduction** (COM classroom 1B, 1st floor) | 12:10-12:20 |
| **Keynote Speaker, Dr. Elena Dedkova** (COM classroom 1B, 1st floor)<br>Associate Professor of Physiology, Department of Basic Sciences, CNUCOM | 12:20-1:10 |
| **Podium presentations** (COM, classrooms, 1st floor) | 1:10-2:25 |
| **Room 1A (**O1-O5 Podium presentations**)** | |
| **Room 1B (**O11-O15 Podium presentations**)** | |
| **Podium presentations** (COM, classrooms, 1st floor) | 2:35-3:50 |
| **Room 1A (**O6-O10 Podium presentations**)** | |
| **Room 1B (**O16-O20 Podium presentations**)** | |
| **Awards & Closing Remarks** (COM, classroom 1A, 1st floor) | 4:00-4:25 |

## Event Locations

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| **Breakfast/Reception** | **MPS classroom 2nd floor** |
| **Poster Presentations** | **P3 classroom 2nd floor** |
| **Lunch** | **COM 1A & 1B classrooms, 1st floor** |
| **Keynote Speaker** | **COM 1B classroom, 1st floor** |
| **Podium Presentations** | **COM 1A & 1B classrooms, 1st floor** |
| **Awards and Closing Remarks** | **COM 1A classroom, 1st floor** |

**Keynote Speaker**: **Elena Dedkova**, DVM, PhD

Associate Professor of Physiology, Department of Basic Sciences, California Northstate University, College of Medicine

# Lethal Cardiomyopathy in Friedreich's Ataxia: is there a hope?

Dr. Dedkova is one of the global leaders in the field of mitochondrial research and cardiovascular physiology. Prior to coming to CNU College of Medicine, Dr. Dedkova held faculty positions at the University of California School of Medicine in Davis, CA, Rush University School of Medicine and Loyola University School of Medicine in Chicago, IL. At CNUCOM she teaches Physiology courses for M1 and M2 students.

Dr. Dedkova's research is focused on developing new therapeutics for lethal cardiomyopathy in Friedreich's Ataxia (FA). Her lab uses most clinically relevant animal models of FA and pharmaceutical interventions in combination with the state-of-the-art *in-vivo* imaging techniques. Friedreich's ataxia is a monogenic recessive ataxia caused by reduction of a single mitochondrial protein, frataxin. Although the name of Friedreich's ataxia refers to the neurodegenerative ataxia, most patients with FA die in their 30s from cardiac failure, caused by deficient frataxin expression in the heart. Currently, there is no FDA approved therapy for this devastating disease. The ultimate goal of Dr. Dedkova's work is to investigate the signaling mechanisms which lead to the progression of ataxia, neurodegeneration and cardiac failure in Friedreich's ataxia, identify potential drug treatments which can ameliorate the development of disease and extend the life of affected individuals.

Moreover, Dr. Dedkova has a long-standing interest in examining effects of ketones and ketogenic diets on cardiovascular health. Dr. Dedkova has identified the role of 18-kDa outer mitochondrial membrane transporter (TSPO) protein in cardiovascular health and disease. She published her research data in high-impact journals such as Circulation Research, Proceedings of the National Academy of Sciences (PNAS), Cardiovascular Research, Journal of the American Heart Association (JAHA), Frontiers in Mitochondrial Biology, and many others.

## Research Interests

Drug development, Heart Failure, Cardiac hypertrophy, Cardiac Metabolism, Cardiovascular signaling, Mitochondrial Function, Type 2 diabetes, Ketones, Ketogenic diets, TSPO

# Podium Presentation Abstracts

## Oral Presentations: College of Medicine

**Abstract # O1**

**Type of presentation: Oral**

**Authors:** Leah Bourgan[1] , Kathleen Pavy[1], Faith Sumandea[1], Carol Parise PhD[2], Andrea Hankins[3], and Arpita K. Vyas[1,3]
[1]College of Medicine, California Northstate University.
[2]Sutter Center for Health Systems Research.
[3]School of Medicine, Washington University in St. Louis

**Title:** Gestational Diabetes Mellitus Incidence in Greater Sacramento Region During the COVID-19 Pandemic

**Introduction:** Emerging evidence suggests a link between the COVID-19 pandemic period and gestational diabetes mellitus (GDM) incidence. Though GDM incidence has increased during the pandemic, the underlying etiology of the rise remains unclear. Our study aims to explore the association of the COVID-19 pandemic with GDM in the Sacramento Region and identify contributing risk factors.
**Methods:** The Sutter Sacramento Valley EPIC database was used to collect maternal delivery data from October 2015-May 2022. Three time periods were defined: Pre-Pandemic (10/2015-2/2020), Lockdown (3/2020-12/2020) and Post-Lockdown (1/2021-5/2022). Logistic regression analysis was used to assess the association of time period on GDM after controlling for age, race/ethnicity, pre-pregnancy weight, alcohol use, number of deliveries, and presence of preeclampsia, PCOS, and gestational hypertension. A second set of three logistic regression models were conducted to assess the association of each of these factors with GDM during each time period.
**Results:** 41,246 deliveries were recorded with an overall GDM incidence of 5.4%. When compared with the Pre-Pandemic period, GDM incidence was 38% higher in the Lockdown period (OR=1.377, 95% CI 1.16-1.63), but not in the Post-Lockdown period. In the Pre-Pandemic period, the number of deliveries and pre-eclampsia were associated with an increased risk of GDM whereas gestational hypertension and gestational alcohol use were associated with a decreased GDM risk (p35 years, Hispanic, Asian, or “Other” race, and increased pre-pregnancy weight.
**Conclusion:** GDM incidence increased during the COVID-19 related lockdown in Sacramento. This increase cannot be fully explained by risk factors such as advanced maternal age, elevated pre-pregnancy weight, or race/ethnicity.

**Abstract # O2**

**Type of presentation: Oral**

**Authors:** Michael Wang[1], Fateme Montazeri[2], Abhijith Atkuru[3], Marcela Maria Estrada[2], Yin Allison Liu[2,4], and Parisa Emami-Naeini[2]
[1] California Northstate University College of Medicine, Elk Grove, CA
[2] Department of Ophthalmology & Vision Science, Tschannen Eye Institute, University of California, Davis, Sacramento, CA
[3] Eastern Virginia Medical School, Norfolk, VA
[4] Departments of Neurology and Neurosurgery, University of California, Davis, Sacramento, CA

**Title:** Racial/Ethnic Diversity in the US Ophthalmology Clinical Trials

**Introduction:** Equitable inclusion and representation of racial/ethnic groups in clinical trials is important in producing generalizable data. Disparities and mismatches between clinical trial participants trials’ enrollees and general population result in selection bias and distortion of information generated by these studies. The purpose of current study was to investigate the status of racial/ethnic disparities in the ophthalmology clinical trials conducted in the United States.
**Methods:** In this retrospective cross-sectional study, we utilized demographic reports of completed phases 2/3, 3, and 4 ophthalmology clinical trials conducted in the US, using the ClincialTrials.gov database. We calculated proportional enrollments of racial/ethnic groups in the trials and compared them to the 2010 US Census data as the reference population. Using regression analysis, we examined the association between various trial features (i.e., phase of the trial, starting year, funding source, and primary condition) and rate of disclosing demographics data and inclusion of racial/ethnic minorities.
**Results:** Among the total of 653 completed trials, racial/ethnic background were reported in 128 trials (43.6% of the studies, comprising 3 7031 participants). Compared to the US census data, White individuals were enrolled more commonly (median 76.6%, Inter quartile range (IQR) 69.0-84.0%) and minority groups, including Asians (median 1.8%, IQR 0.4-3.8%), Hispanics (median 12.5%, IQR 6.3-17.5%), and other group (median 1.7%, IQR 0.2-4.3%) were underrepresented (p<.001). Interestingly, enrollment of African-American individuals was comparable to their population estimates (median 12.4%, IQR 6.2-20.8, p=0.44). Rate of reporting race/ethnicity data was higher among earlier phase (2/3 and 3) trials and increased over time (average increase of 11.4% annually; p<0.001). Additionally, glaucoma trials had greater enrollment of Black individuals (p=0.001).
**Conclusion:** Racial/ethnic disparities in clinical trials enrollment can skew the results of these studies and compromise generalizability of findings. Ophthalmology trials suffer from significant underrepresentation of minorities. More efforts are needed to reduce disparities and ensure unbiased discoveries.

**Abstract # O3**

**Type of presentation: Oral**

**Authors:** Mengyao Liu[1, 2, 3], Olivia Wu[1], Hubert Kim[2,3], and Xuhui Liu[2,3]
[1]College of Medicine, California Northstate University
[2]University of California, San Francisco, Department of Orthopaedic Surgery
[3]San Francisco Veterans Affair Health Care System

**Title:** Fibro-adipogenic Progenitors (FAPs) in Heart, Diaphragm, and Muscle in a Novel PDGFRa-reporter Duchenne's Muscular Dystrophy (DMD) Mouse Model

**Introduction:** DMD is a fatal genetic disease caused by the loss of dystrophin expression and affects 1 in 3500 males. Limited therapeutic options are available and there is no cure for this disease. Fibro-adipogenic progenitors (FAPs) are muscle progenitor cells that are responsible for maintaining muscle homeostasis, as well as the precursor cells responsible for pathological fibrosis and fatty infiltration in many muscle diseases. We generated a novel experimental mouse strain by crossing PDGFRa reporter mice with the D2-MDX mouse which lacks dystrophin expression and exhibits profound muscle degeneration with fibrosis, similar to what is seen in DMD patients. We used this mouse to test the hypothesis that FAPs proliferate and undergo fibro/adipogenesis with the development of muscle degeneration in DMD.
**Methods:** A novel FAP-MDX reporter mouse model was generated by crossing PDGFRa-eGFP reporter mouse to D2-MDX mouse. F6 PDGFRα-eGFP/D2-MDX were sacrificed at 3 months of age. Heart, diaphragm, and tibialis anterior (TA) muscles were harvested for histology analysis. The percentage of FAPs from heart, the diaphragm, and TA muscles were quantified by flow cytometry. Gene expressions of FAPs as well as whole TA muscle were analyzed by qPCR.
**Results:** The percentage of FAPs in heart, diaphragm and TA from DMD mice was significantly increased. FAPs from DMD mice have significantly increased expression of mitochondrial markers, and fibrogenic markers, significantly decreased expression of beta3 adrenergic receptor, a key receptor for Beige differentiation. DMD myofiber have markedly increased Evan's blue staining and trichrome staining showed that MDX group had higher fibrosis index than DBA mice.
**Discussion:** In this study, we generated a novel FAP reporter DMD mouse model, which can be used to investigate the role of FAPs in the pathophysiology of DMD. FAP Beige differentiation may be suppressed during the development of DMD. Stimulation of FAP Beige differentiation may be a possible treatment option to improve muscle regeneration in DMD. A higher number of PDGFRa(+) FAPs are observed in the heart of MDX mice, which suggests FAPs may be responsible for cardiac fibrosis as well. Treatments targeting at FAPs may benefit both skeletal and cardiac muscle degeneration and fibrosis.

**Abstract # O4**

**Type of presentation: Oral**

**Authors:** Pauldeen Davejan[1], Neha Vonter[1], Richard Wang[1], and Valerie Gerriets[1]
[1]College of Medicine, California Northstate University, Elk Grove, California

**Title: The impact of a chosen medical specialty on stress and anxiety levels among third and fourth year medical students**

**Introduction:** The challenges of medical school have been shown to adversely impact the mental health of students both during school and afterwards. Many suffer from increased anxiety, depression, and burnout that can have prolonged personal and professional consequences. Understanding the specific sources of stress in a medical school environment can support wellness initiatives that aim to mitigate these unintended psychological issues. While there is research regarding certain stressors, one that has yet to be further explored is a medical student's chosen specialty. Our hypothesis is that pursuing highly competitive specialties, specifically any surgical specialty, radiation oncology, and dermatology leads to a greater negative impact on third and fourth year medical student's levels of stress and anxiety as opposed to less competitive specialties.
**Methods:** Starting from August of 2017, current CNUCOM medical students and subsequent incoming cohorts were invited to participate in a survey regarding their psychological well being. This project focuses on the responses of third and fourth year medical students to the 10-item Perceived Stress Scale (PSS10) and 7-item Generalized Anxiety Disorder (GAD-7) scale. The questionnaire also asks participants a few questions separate from the aforementioned scales including which residency programs they are currently interested in pursuing. Using the National Residency Match Program (NRMP) data, we defined a specialty as competitive based on the total number of US MD/DO applicants divided by the total number of seats available for that specialty. A specialty was considered competitive if its ratio was >1. If participants select multiple interested specialities then the most competitive specialty was chosen for analysis. The data will be analyzed using linear regression models. To determine significance, one-way ANOVA tests will be performed using each participant's speciality competitiveness and composite scores from each of the two scales used in the questionnaire. The competitiveness of the specialties each respondent was pursuing will serve as the independent variable and respective PSS10 and GAD-7 scores will serve as dependent variables.
**Results:** Within our pool of 59 eligible survey participants, 24 (41%) reported choosing a competitive specialty. The mean PSS10 score among participants choosing competitive specialties is 15.13 and 16.2 among those choosing non-competitive specialties. ANOVA analysis calculates a p-value of 0.46. The mean GAD-7 score among participants choosing competitive specialties is 4.83 and 4.62 among those choosing non-competitive specialties. ANOVA analysis calculates a p-value of 0.86.
**Conclusion:** There is no significant difference in levels of stress and anxiety between students who pursue highly competitive specialties and those that pursue less competitive specialties.

**Abstract # O5**

**Type of presentation: Oral**

**Authors:** Michael G Chez[1,2], Aimee Miller[2], Ivy Liu[3], Johann Park[2], Monica Dudley-Weldon, MSL[1], and Ellen Morgan[1]
[1]Sutter Neuroscience
[2]California Northstate University College of Medicine
[3]Midwestern University Arizona College of Osteopathic Medicine
[4]Syngap 1 Foundation

**Title:** Serial EEG Patterns and Treatment Regiment Choices in Patients with **Syngap1**

**Introduction:** Syngap1 is a rare childhood Developmental Epileptic Encephalopathy (DEE) with defect of the autosomal dominant Syngap1 gene on chromosome 6p21.32. Syngap1 is involved in NMDA receptor mediation of synaptic plasticity, the insertion of AMPA receptors in neuron membranes, and the formation of dendrites and axons, presenting as epileptic encephalopathies with autistic and intellectual disabilities. We present a collection of serial EEG data on 30 patients with Syngap1 showing typical EEG findings and lack of significant change over time despite pharmacologic treatments for epileptic clinical conditions.
**Methods:** We assess serial EEG reports of 30 patients de-identified from databases from international medical facilities and review medical information. Patient ages were from 18 months to 18 years. Northstar IRB was used and consent obtained from patient families by the Syngap1 Foundation to study this data. Patients had 1 to 13 EEG studies each. Medications used were reviewed and any EEG effect noted as could best be assessed. Limitations are interpretive reports were only available to review and clinical treatment information limited to historical medical reports or information in EEG reports.
**Results:** Seizures seem to respond to Valproate as the most commonly used medication in this 30-patient cohort with lamotrigine, ethosuximide, levetiracetam, clobazam, cannabidiol, and rarely felbatol being used for treating atypical absence, myoclonic seizures, eyelid myoclonus, and atonic/tonic seizures. EEG data starts early in life with posterior predominant synchronous and asynchronous spike wave activity, with younger children showing more atypical and more continuous slow spike wave activity between 2-7 years of age. Multifocal and generalized spike wave discharges are seen in all reports with limited evidence of medications affecting EEG patterns through toddler age to adolescence in this database.
**Conclusions:** These findings suggest early life EEG patterns that do not change significantly over time. EEG patterns involve diffuse cortical regions with posteriorly distributed multifocal and generalized epileptic patterns on serial EEG studies with little variation of type of Syngap1 mutation. Further research in how the Syngap1 defect can generate these EEG patterns is warranted.

**Abstract # O6**

**Type of presentation: Oral**

**Authors:** Ellen Chao[1], Xuesong Wu[2], and Samuel T Hwang[2]
[1]California Northstate University College of Medicine, Elk Grove, CA
[2]Department of Dermatology, UC Davis School of Medicine, Sacramento, CA

**Title:** Bile Acids Reduce Inflammation in Western-Diet Induced Psoriatic Mice

**Introduction:** The Western Diet (WD), which is a diet that includes moderate-to-high amounts of fat and high levels of simple sugars, is associated with increased skin inflammation that is suggestive of psoriasiform dermatitis (PsD). Studies on bile acids (BAs), such as lithecholic acid (LCA) and ursodeoxycholic acid (uDCA), have shown that BAs modulate innate and adaptive immunity in such inflammatory disorders and could be used as potential therapeutic drugs in treating PsD.
**Methods:** An in vitro dose-titration study investigated the optimal concentration of uDCA and compare it to that of LCA in HaCaT cells treated with TNFα to stimulate inflammation. Next, an ex vivo study that utilized mouse ear skin co-cultured with lymph node cells stimulated with the pro-inflammatory cytokine IL-23 to further elucidate the anti-inflammatory effects of uDCA and LCA in a dose-dependent manner. A final in vivo study in WD-induced C57BL/6 psoriatic mice is currently in progress to determine the therapeutic benefit of bile acids in the disease model of psoriasis. Quantification of γδ-T cell infiltration as well as other major immune populations such as macrophages and neutrophils were calculated using flow cyotmetry. Additional reverse transcriptase-polymerase chain reaction (RT-PCR) experiments allowed us to quantify the expression levels of inflammatory markers such as CCL2, CCL20, LOX-1, IL-17A, and IL-36A. Comparisons were analyzed using a one-way ANOVA test with a 95% confidence interval.
**Results:** The in vitro dose-titration study revealed the largest decreases in concentrations of inflammatory markers, such as CCL2 ($p < 0.0001$), CCL20 ($p = 0.0074$), LOX-1 ($p = 0.0004$), and IL-17A ($p < 0.0001$), in HaCaT cells stimulated with TNFα at 200 uM LCA. The same concentration of uDCA decreased inflammatory markers, though not as dramatically as that of LCA (CCL2 $p = 0.0015$, CCL20 p = ns, LOX-1 $p = 0.01$, IL-17A p = ns). The ex vivo dose-titration assay further confirmed this optimal dose of LCA and uDCA by demonstrating marked decreases in concentrations of IL-17A ($p = 0.0001$, $p < 0.0001$, respectively) and IL-36A ($p = 0.04$, $p = 0.02$, respectively). Finally, preliminary results from the in vivo study have shown that mice fed a WD and supplemented with LCA or uDCA had decreased ear thickness, though not statistically significant at the current bile acid concentration.
**Conclusion:** Bile acids LCA and uDCA demonstrate anti-inflammatory effects in both in vitro and ex vivo PsD models, and this observation seems to be affirmed by preliminary results from the in vivo study in WD-induced PsD mice. These results support bile acids as potential therapeutic drugs to treat psoriasis.

**Abstract # O7**

**Type of presentation: Oral**

**Authors:** Austin Lee[1], Max Haffner[2], Eric Giza[2], and Christopher Kreulen[2]
[1]College of Medicine, California Northstate University
[2]UC Davis Health System

**Title:** Wound Complications of Rapide vs Nylon Sutures in Foot and Ankle Surgery

**Introduction:** Nylon sutures are among the most used sutures in the surgical field today. Nylon sutures are generally regarded to have fewer complications than other suture types, which explains their wide use in a variety of surgical subspecialties. However, nylon's complication rates have not been extensively compared against absorbable braided sutures, such as Vicryl Rapide. When compared to nylon, rapide has a decreased need for patients to get their stitches removed. We sought to determine if rapide sutures could be potential substitute for nylon. We hypothesize that dissolvable rapide sutures will have lower rates of surgical site infections when compared to Nylon sutures.
**Methods:** We conducted a retrospective cohort study of 223 adults aged 18 to 90 years old at the time of surgery who underwent Foot and Ankle Surgery between July 2016 and December 2017 in the UC Davis Health System. All surgeries were performed by two fellowship-trained orthopedic Foot and Ankle surgeons, and sutures were chosen at the surgeons' discretion. The type of suture used for surgical incision closure and any surgical site infections were recorded and compared using a chi-squared test with a 0.05 significance level.
**Results:** Out of the 175 patients with nylon sutures, 11 had a superficial or deep infection, and 3 of the 48 patients with rapide sutures had a superficial or deep infection. A contingency table was constructed, resulting in a chi-square statistic of <0.01 and p-value of 0.99. However, using the Yates' correction for the chi-square test results in a Yates' chi-square of 0.11 and a Yates' p-value of 0.74.
**Conclusions:** We did not see any significant difference between nylon and rapide sutures and their infection rates. Given the characteristics and convenience of absorbable braided sutures, more investigation into rapide suture complication rates can potentially reduce the volume of office visits, healthcare utilization, and burden on patients if used in lieu of nylon.

**Abstract # O8**

**Type of presentation: Oral**

**Authors:** Gary Moy[1], HsinYu Lee[1], Jennifer Ng[1], Victoria Giang[1], and Valerie Gerriets[1]
[1] College of Medicine, California Northstate University

**Title:** Burnout In Medical Students Who Have and Have Not Taken the Healer's Art Course

**Introduction:** Healer's Art is hypothesized to decrease burnout rates among medical students. Our research indicates that students who took the Healer's Art course should have a significant reduction in emotional exhaustion as opposed to students who have not taken the course. This study assesses whether the wellbeing of California Northstate University (CNU) medical students is impacted by enrolling in a course about empathy and wellness.
**Methods:** The study was conducted through a survey disseminated via email to students at CNU from 2017 to 2020. Students were sent the Oldenburg Burnout Inventory (OLBI) which consisted of 16 items used to evaluate two dimensions of burnout: exhaustion and disengagement. The responses ranged from strongly agree to strongly disagree and were assigned a value according to the OLBI scale. Participants were grouped into those who had taken Healer's Art and those who had not, with the test variable being the scores on the OLBI survey. Each of the student's total OLBI score was calculated by summing the two sub totals assessing disengagement and exhaustion. The higher the score, the greater the level of burnout. Students who did not fill out the entire form were not included in calculations for the data.
**Results:** 251 students were surveyed with 25.5% participating in the Healer's Art course. The mean OLBI score for all students surveyed was 35.5223. Of the 64 students who participated in the Healer's art course, the mean OLBI score was 35.5. Of the 187 students who did not participate in the Healer's art course, the mean OLBI score was 35.5297. The data was analyzed with an unpaired T-test and 95% confidence interval showing a statistically insignificant difference in burnout.
**Conclusion:** Our study suggests that there is no significant decrease in burnout among students who enrolled in the Healer's Art elective. This is significant as a predictive factor in determining success of the course for the wellbeing of future CNU students.

**Abstract # O9**

**Type of presentation: Oral**

**Authors:** Prasanth Kurup[1*], Bashar Alkhatib[2*], Mary Jabari[1*], Stephanie Domke[3], Joseph Ciarelli[3], Brooke Pallas[3], Nicholas Olivier[4], Vasantha Padmanabhan[3], and Arpita Kalla Vyas[2].
[1]California Northstate University, College of Human Medicine, Elk Grove, CA, USA [2]Washington University St. Louis, Department of Pediatrics, St. Louis, MO, USA
[3]Department of Pediatrics, University of Michigan, Ann Arbor, Michigan, USA
[4]College of Veterinary Medicine, Michigan State University, Lansing, USA

**Title:** Sex-specific Programming of the Late Gestational Fetal Heart with Prenatal T Excess

**Introduction:** Excess testosterone (T) exposure from early to mid-gestation (days 30-90) leads to sexually dimorphic adverse cardiac programming at fetal day 90 (term 147 days). Whether this is direct effect of T or reprogramming that persists is unknown. We hypothesized that gestational T excess leads to sex specific cardiac reprogramming that persists into late gestation and neonatal period.
**Methods:** Pregnant ewes were injected 100 mg T or oil-vehicle (C), twice weekly (day 30 to 90). At day 120±5 gestation, fetal body weight (BW) and heart weights were recorded, and left ventricles (LV) processed for molecular analysis (Female C (FC) n=5-6, T (FT) n=7-8; Male C (MC) n=6-7, T(MT) n=6).
**Results:** Prenatal T excess reduced BW in both sexes compared to C (male: 3.38±0.15 vs.2.68±0.14, p=0.001, Cohen's effect size: d=1.29; female: 3.27±0.21 vs. 2.72±0.11, p=0.03, d=1.08). LV/BW ratio (3.62±0.15 vs 3.15± 0.11, p=0.04, d=0.81) was increased in MT compared to MC and not in females suggestive of sex specific programming. Prenatal T excess had no impact on insulin, estrogen or androgen receptor expression at day 120 in both sexes. However, downstream protein expression of p AKT/Total AKT ratio was significantly downregulated in MT compared to MC (MT-0.36±0.10 vs MC 0.47±0.11, p=0.03, d=1.34) with a non-significant moderate magnitude decrease in FT (FT-0.34±0.08 vs FC 0.50±0.14, d=0.63). A significant downregulation of mTORC1 (0.86±0.05 vs 1.00±0.01, p=0.02, d=1.51), a non-significant moderate magnitude decrease in SERCA (0.85±0.07 vs 1.03±0.12, p=0.2, d=0.7), and a non-significant large magnitude decrease in Col1A1 (0.71±0.28 vs 1.02±0.09, p=0.02, d=1.48) gene expression were evident in MT compared to MC as opposed to no differences in females. Cytochrome C and PERK (mitochondrial metabolism genes) expression were downregulated in FT compared to FC (0.76±0.08 vs 1.02±0.09, p=0.07, d=1.07 and 0.81±0.10 vs 1.01±0.08, p=0.17 d=0.79 respectively) but not in males.
**Conclusion:** These results suggest that sex specific adverse impact of prenatal T excess seen at day 90 gestation fetal heart persist into late gestation. Furthermore, there is evidence of subtle cardiac programming persisting at birth in MT.

**Abstract # O10**

**Type of presentation: Oral**

**Authors:** Bahaar Kaur Muhar[1], Satori Iwamoto[1], Ashwin Sidhu[1], Hao Chen[2], and Gary Chu[1]
[1] College of Medicine, California Northstate University
[2] Yokohama City University Dept of Respiratory Internal Medicine

**Title:** Different COVID-19 Treatment Impact on Hospital Length of Stay

**Introduction:** COVID-19 was first reported in December 2019 and has since adversely affected global healthcare infrastructure. Currently, there are no large-scale published reports on the efficacy of combination therapy of dexamethasone, remdesivir, and tocilizumab on COVID-19 patients. We analyzed different inpatient COVID-19 treatment options available in the United States and their impact on hospital length of stay and mortality in this retrospective study.
**Methods:** We analyzed 1,103 COVID-19 patients admitted from 2020 to 2021 in a North California community hospital. They were categorized as "mild," "moderate" and "severe" based on their highest level of oxygen required; room air, nasal cannula, or high flow/PAP/intubation, respectively.
**Results:** No treatment combinations showed a statistically significant decrease in hospital LOS in mild COVID-19 patients (p = 0.92). In moderate patients that received a combination of remdesivir and dexamethasone their LOS slightly decreased by 1 day (p=0.009). In severe patients that received a combination of remdesivir, dexamethasone, and tocilizumab, LOS was decreased by 5 days (p=0.011). No treatment arm appears to show a statistically significant decrease in mortality for patients across all severity of COVID-19 patients.
**Conclusion:** Our findings suggest that dexamethasone and remdesivir in moderate COVID-19 patients and combination therapy of dexamethasone, remdesivir and tocilizumab in severe COVID-19 patients may decreases patient's hospital LOS. Furthermore, remdesivir may not be clinically beneficial for mild COVID-19 patients – and considering its high cost – could be reserved for moderate and severe patients. Further analysis with more patient data may increase statistical power and solidify this finding.

# Oral Presentations: College of Pharmacy

**Abstract # O11**

**Type of presentation: Oral**

**Authors:** Anh Doan[1], Austin Qiu[1], Trieu Nguyen[1], Sakib M. Moinuddin[1], Melanie Rose[1], Tanoy Sarkar[1], Fakhrul Ahsan[1] and Zhuqiu Jin[1].
[1] College of Pharmacy, California Northstate University

**Title:** Microfluidic Chip Fabrication and Optimization for Endothelial Cell Permeability Determination

**Introduction:** Endothelial cell barrier integrity is essential for maintenance of cell micro-environmental stability and homeostasis. Organs-on-a chip, also known as mico-physiological systems or "tissue chips" are systems containing engineered or natural miniature tissues grown inside microfluidic chips. A microfluidic chip usually has more than two channels used to seed the cells and the media. These channels are separated by barriers made of micro-posts in between which is convenient for observing cell permeability or cell-cell communication. **Objectives:** The application of three-dimensional (3D) microfluidic chips can be used in a variety of research studies including cell survival, cell proliferation, and permeability differentiation under controlled conditions. In addition, the chip's structure and proper techniques of cell injection are also optimized to increase the success rate of cell seeding inside the chip. **Methods and Results:** By introducing the use of the syringe with tubing and loading pipet tip method to inject cells suspension of human cardiac microvascular endothelial cells (HCMECs) and medium into poly-D-lysine coated chips and the optimized Zig-zag structure, which creates more resistance in the channels of the chip, the success rate of injection was significantly increased compared to traditional pipet delivery and syringe with tubing alone methods. Our protocol in this presentation describes the step-by step on fabricating 3D microfluidic chips of HCMECs. **Conclusions:** We developed and demonstrated the structure and method to increase the rate of injection for cell suspension and medium into the 3D microfluidic channel chips. These optimizations enhance quantity and quality of endothelial cells grown in an engineered 3D environment and provides a tool for function study of endothelial cells.

**Abstract # O14**

**Type of presentation: Oral**

**Authors:** Farah Sedki[1], Mandeep Kaur Rajpal[1] and Tony J Eid[1]
[1] College of Pharmacy, California Northstate University

**Title:** Statin-Induced Myopathy in a Patient with Schwartz-Jampel Syndrome (SJS)

Schwartz-Jampel syndrome (SJS) is a rare musculoskeletal disease that results from a hereditary abnormality. Affected individuals can present with a range and severity of symptoms associated with myotonia and chondrodysplasia. This paper seeks to highlight the curious case of the marked resolution and reduction of LDL-C levels after a novel combination of statins and a Proprotein Convertase Subtilisin/Kexin type 9 (PCSK9) inhibitor, regulating serum LDL-C levels. We report a case of a statin induced myopathy in a patient with a history of SJS and heterozygous familial hypercholesterolemia. A review of her baseline labs demonstrated a CPK level of 230 mg/dL and an LDL-C of > 200 mg/dL. Patient was started on high intensity statin Rosuvastatin 20 mg by mouth daily to achieve an LDL-C reduction of < 50%. Subsequently, the patient started exhibiting nonspecific pains with an increase in her CPK to a level as high as 298 mg/dL. The Rosuvastatin was stopped and her CPK levels returned to baseline. The patient was started on Evolocumab 140 mg twice monthly for 1 month. Similarly, her CPK levels started to increase to a maximum of 297 mg/dL. Evolocumab was then reduced to 140 mg once monthly with a CPK of 224 mg/dL. Interestingly, the patient was able to achieve an LDL-C of 96 mg/dL on Repatha 140 mg once monthly and maintain her baseline CPK levels for about 1 year before she left our treatment facility. Our case concludes that alternative treatment with PCSK9 inhibitors once monthly may help prevent CPK elevation and lower the risk of myopathy in patients with SJS while still reducing serum LDL-C levels. The key here is to not deter the clinician from using alternative options to treat hypercholesterolemia in a patient with SJS and that unconventional dosing seems to work well without worsening CPK.

**Abstract # O17**

**Type of presentation: Oral**

**Authors:** Rami Almukhtar[1] and Tuan Tran[1]
[1] College of Pharmacy, California Northstate University

**Title:** Assessing the relationships between demographic/geographic/socioeconomic status and COVID-19 disparities in the US: storytelling with data

**Objectives:** Our aim is to understand the relationship between demographic, geographic, socioeconomic factors and COVID-19 infections and deaths in the US. **Methods:** We used available data of COVID-19 incidence rates in the US from the reports published by CDC, John Hopkins Coronavirus Resource Center, and State level public health offices between March 2020 and March 2022. We performed descriptive analysis and statistical analysis using Kruskal-Wallis test to compare the differences among the groups. We used a threshold of 95% of confidence interval in our statistical test. **Results:** The highest incidence of COVID-19 infections and deaths were found in the following states (CA, NY, FL). Statistical analysis showed no significant difference in cases between rural and urban areas. However, significantly higher deaths were found in rural areas ($p<0.001$). Significant difference in cases between communities with high and low poverty levels was found ($p=0.002$) with higher cases in communities with higher poverty. Significant difference in deaths between communities with low and medium ($p<0.001$), medium and high ($p<0.001$), and low and high level of poverty ($p<0.001$) with higher deaths in communities with higher poverty level. Statistical analysis by uninsurance status showed significant difference between communities with high and low uninsurance levels ($p=0.01$) with higher cases in communities with higher uninsured population. The data showed that a statistically significant difference was identified between communities with low and medium ($p<0.001$), medium and high ($p=0.001$), and low and high level of uninsurance ($p<0.001$) with higher deaths in communities with higher uninsurance levels. **Conclusions:** Higher cases were reported in states with the higher populated densities. Higher death rates were identified in the rural areas. Furthermore, higher cases were identified in communities with higher poverty and higher rate of uninsured. The findings provide useful information for public health professionals to allocate resources for future events.

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## Oral Presentations: College of Health Sciences

**Abstract # O12**

**Type of presentation: Oral**

**Authors**: Medha Garg[1], Jayani Villuri[1], Mahitha Ravipati[1], and Faik Bouhrik[1]
[1] College of Health Sciences, California Northstate University.

**Title**: A Redefined Outlook for Robots in Medicine

Robots are being used in the healthcare industry to complete various jobs that improve patient care. Surgical, rehabilitation, and mobility are the three roles that are the most prevalent. There is a significant demand for robots, particularly in the healthcare field, as a result of the rising number of COVID-19 patients. Maintaining social distance has become a necessary preventive precaution because SARS-CoV-2 predominantly spreads through close human contact and infected surfaces. Robotics in the healthcare industry reduces the need for medical staff by preventing front-line healthcare workers from contracting the coronavirus and allowing some medical tasks from being partially performed by robots. The purpose of this study was to draw attention to the significance of robotic applications in the healthcare industry. To do this, a thorough analysis, of the robots used globally during the COVID-19 pandemic to attenuate the virus, was carried out. The study's findings indicate that using robots in the healthcare industry can significantly reduce the transmission of SARS-CoV-2 since it prevents the virus from spreading between patients and physicians. Additionally, a qualitative semi-structured one-on-one interview addressing the function of robotic applications in healthcare settings was carried out. Sampling was used to identify a spectrum of people working in various health care settings who are involved in designing, developing, and using robotics. These accounts suggested that there are significant opportunities for robotics to improve the safety, quality, and effectiveness of healthcare, but the analysis also identified barriers that must be overcome, including ethical considerations. Overall, robots can assist the healthcare industry improve, which would be beneficial in the fight against contagious diseases like COVID-19 on many fronts. The proper integration of robotic applications in healthcare settings is likely to provide major sociotechnical obstacles, particularly for patient-facing tasks. For effective innovation and adoption, these must be recognized and addressed.

**Abstract # O15**

**Type of presentation: Oral**

**Authors**: Arnav Wadhawan[1] and Nicholas Valley[1]
[1] College of Health Sciences, California Northstate University.

**Title**: Using your Immune system to battle breast cancer

Breast cancer is the second most common cancer in women in the United States of America, is the second leading cause of cancer death in women and the incidence of breast cancer is rising yearly. A combined approach aimed at identifying a potential immunotherapeutic agent and providing information to the public affected by breast cancer was undertaken. Tumors often generate immune-suppressive environments that downregulate the body's ability to fight cancer. Drugs that work to reduce the immune-suppressive effects by targeting the CTLA-4 and PD-L1 immune checkpoint ligands have already proven effective. Another possible target is LAG-3 which is seen in 73% of breast cancers. LAG-3 is a protein whose role involves controlling over-activation of immune response and prevents the onset of immunity. However, in tumors, this leads to impaired proliferation of immune cells, which allows tumor growth. A combination of computational programs were used to test 18,000 molecules from the NCI database for their binding affinity to LAG-3, their bioavailability, and their toxicity to humans. The molecules with the greatest potential as immune checkpoint inhibitors were identified, with Flavanthrone showing the greatest promise. Effective therapeutics are only one part of treatment. To better inform the public about aspects of breast cancer treatment, along with Dr. Michael S. Wong, we created an informational poster about breast reconstruction presented at the Breast Reconstruction Awareness (BRA) Day at UC Davis on October 19, 2022.

**Abstract # O18**

**Type of presentation: Oral**

**Authors**: Aditya Sharma[1], Mehar Brar[1], Meher Bal[1] and Tereza Joy Kramer[1]
[1] College of Health Sciences, California Northstate University.

**Title**: Community Outreach and Food Insecurity: Serving With the Residents of Mirasol Housing Village

Food insecurity affects 43% of adults and 42% of children in low-income households within Sacramento County. Nevertheless, access to healthy, nutritious meals and the issue of food insecurity are too often overlooked. . Therefore, our objective was to bring a fresh meal program to the newly constructed mixed-income Mirasol Village Housing Complex, in collaboration with three nonprofits: Alchemist CDC, Fresher Sacramento, and the Sacramento Housing and Redevelopment Agency (SHRA). Mirasol Village is located in a food desert, and there is minimal public access to transportation. We engaged with residents and presented them with Fresher Sacramento's proposal to provide fresh meals to families, cooked in the Mirasol Community kitchen. The program will offer residents healthier food options for lower prices, while also providing culinary job training and then careers for the residents. We collaborated with resident leaders by joining the Planning Committee of Mirasol Village. We connected more residents with the new community garden, where we volunteered to plant produce and clean the area, as well as set up fundraisers to aid Alchemist CDC in growing the community garden and providing the residents with fresh fruits and vegetables. Both we and the residents are hopeful that the fresh meal program and the community garden will foster a healthier and united community. Ultimately, we hope Mirasol residents will be the ones cooking these meals, for each other. We ourselves learned so much through this entire process, ranging from hosting fundraisers to organizing activities for the children to planning events for the residents. We are appreciative of the opportunity to collaborate, for 6 months, with these community partners and the residents, who taught us to understand other perspectives. They allowed us to see each individual's obstacles and resiliencies, and to comprehend how much food and housing insecurity affects a person's mental health.

## Oral Presentations: College of Graduate Studies
## Master of Pharmaceutical Sciences program

**Abstract # O13**

**Type of presentation: Oral**

**Authors**: Ryan Lovell, Nicholas Le[1], Ahmed El-Shamy[1], Catherine Yang[1], and Eslam Mohamed[1]
[1] Master of Pharmaceutical Sciences, College of Graduate Studies, California Northstate University.

**Title:** Development of Novel Hypoallergenic Peanut Allergoids by Crosslinking the Immunodominant Peanut Protein Arah2

Peanut allergy is an immunological disorder affecting about two percent of the U.S. population and has affected an increasing number of both children and adults over the past few decades. Substantial research and interest have been dedicated to identifying therapies that can provide longer-lasting treatment outcomes and reduce adverse effects as compared with traditional immunotherapy. The goal of this project is to develop a similarly hypoallergenic and efficacious peanut "allergoid" comprised of the immunodominant peanut protein Ara h 2. Several reactive agents (crosslinkers) were examined for their suitability in developing a modified protein product while considering factors such as immunological impact, toxicity, and solubility. The success of the crosslinking reactions was determined by gel electrophoresis and protein staining techniques to identify newly created allergoids with increased molecular weights. The immunological characteristics of the allergoids were tested through two different methods, western blot and enzyme-linked immunosorbent assay (ELISA). The western blot involved the detection of linear protein epitopes with anti-Ara h 2 human IgE from allergic patients. The ELISA involved the same human IgE (as a capture antibody) but assessed the binding of the proteins with the conformational epitopes intact. Multiple different crosslinked allergoids were identified that demonstrated ranging successes in the disruption of IgE binding and overall reaction efficacy. Going forward, additional research will be completed using human basophil cell lines and will examine allergic mediator release and toxicity associated with the allergoids. Following in vitro studies, murine models of peanut allergy will be developed to further determine the utility of the allergoids before eventually pursuing clinical trials.

**Abstract # O16**

**Type of presentation: Oral**

**Author**: Carter Bernal[1], and Ahmed El-Shamy[1]
[1] Master of Pharmaceutical Sciences, College of Graduate Studies, California Northstate University.

**Title:** Sex Disparities Concerning Disease Outcome Amongst SARS-CoV-2 Infection: In vitro Pilot Study

SARS-CoV-2 continues to pervade societies. Clinically, SARS-CoV-2 infection results in higher odds of death and hospitalization for males compared to their female counterparts. The gender-based difference in COVID-19 disease progression led us to investigate the molecular mechanism underlying this growing inequity. Understanding that SARS-CoV-2 exploits the ACE2 receptor to gain cellular entry, we were intrigued by the possibility of differing cellular infection rates across organs representative of both sexes. To rule out this possibility, we extracted RNA from the female and male lung and colon cell lines. Using rt-PCR, the screening of our dichotomous cellular populations revealed that females demonstrated higher ACE2 expression in the lungs, while males exhibited greater ACE2 expression in the colon. Initial infection experiments, using HIV pseudovirus-harboring SARS-CoV-2 spike protein, demonstrated modest overall infectivity in male or female cell lines. Accordingly, we genetically overexpressed ACE2 and TMPRSS2 in the lung (male and female) and colon (male and female) cell lines using a three-plasmid lentiviral transfection. This approach yielded viral vectors carrying the genes for ACE2 with puromycin-based selection and TMPRSS2 with blasticidin-based selection. Then, through retroviral transduction and antibiotic selection, stable lung (male and female) and colon (male and female) cell lines overexpressing ACE2 and TMPRSS2 were successfully developed. Overexpression of ACE2 and TMPRSS2 was confirmed via rt-PCR screening. Subsequent infection experiments using HIV pseudovirus-harboring SARS-CoV-2 spike protein revealed a significant increase in the infectivity in genetically-modified lung and colon cell lines compared to wild-type cells. Therefore, additional infection experiments in the presence of sex hormones such as estradiol and dihydrotestosterone are underway. Current work aims to investigate the role of sex hormones during SARS-CoV-2 infection.

**Abstract # O19**

**Type of presentation: Oral**

**Authors**: Kishore Bharadwaj[1], and Dr Jose Puglisi[2]
[1] Master of Pharmaceutical Sciences, College of Graduate Studies, California Northstate University.
[2] College of Medicine, California Northstate University

**Title:** Characterizing Herd Immunity Through Cellular Automaton Models

The spread of pathogens poses a significant threat to public health, but strategies such as herd immunity and social distancing can help mitigate this risk. However, these strategies rely on a well-informed population, and recent events such as the SARS-CoV-2 pandemic have highlighted resistance to these measures. To address this issue, we have developed a simulation tool using a generalized cellular automaton process. This tool allows users to input parameters such as disease transmissibility, vaccination rates, and social distancing protocols, and observe the resulting impact on population health over time. Students using this tool found it to be an effective aid in understanding herd immunity conceptually. Additionally, we have also developed a probabilistic cellular automaton model that can be used to analyze real-world data and evaluate the effectiveness of herd immunity and social distancing strategies in a given region. Overall, this probabilistic simulation can serve as a valuable epidemiological tool to help characterize public health conditions. Furthermore, this simulation can be used as an educational tool for the general public to better understand the mechanisms of herd immunity and the impact of their own behavior on disease spread.

**Abstract # O20**

**Type of presentation: Oral**

**Author:** Abtin Anvari[1], and Abdelbasset Farahat[1]
[1] Master of Pharmaceutical Sciences, College of Graduate Studies, California Northstate University.

**Title:** Development of Heterocyclic Cations for Mixed Recognition Sequences on the DNA Minor Groove

Abnormal transcription factor expression has been linked to a broad range of chronic diseases, but most notably cancer. Most drugs used to treat diseases like cancer will target protein-binding sites. However, transcription factors lack these, giving them the moniker of “undruggable.” As well, specific recognition of a unique sequence of DNA requires approximately 15 base pairs, and clinically useful drugs to selectively target cellular DNA usually require the use of high molecular weight agents. This leads to limitations such as preparation expense, sample stability, solubility, and cell uptake. Instead of targeting the transcription factors, we focus on transcription factor-DNA complexes using DNA specific sequence agents. Previous research shows that A-T bp and G-C bp recognition molecules are necessary to accomplish this. Researchers have generally focused on the synthesis of heterocyclic cations, like diamidines, to accomplish this due to noted success as an antiprotozoal agent. A-T specific heterocyclic diamidine minor groove binders use H-bond donor groups to interact with the Adenine-N3 and Thymine carbonyl groups on the edges of the A-T bp at floor of the DNA minor groove were developed. They are unable to similarly bind to G-C base pair sequences because G-NH2 (in G-C bps) projects into the groove and interferes with binding both sterically and electronically, making them unhelpful for mixed base pair recognition. Instead, G-C bp recognition heterocyclic cations that incorporated N-alkylBI thiophenes found success due to the σ-hole motif present in the N-alkylBI. Continuing on this work, we synthesize two compounds each with the purpose of A-T bp and G-C bp recognition respectively expanding on previous research.

# Poster Presentation Abstracts

## Poster Presentation: College of Medicine

**Abstract # A1**

**Type of presentation: Poster**

**Authors:** Emily Chou[1], Esther Chang[1], and John Cusick[1]
[1]College of Medicine, California Northstate University.

**Title:** RELTfms Involvement in Human Breast Cancer Growth and Cellular Apoptosis

**Introduction:** Receptor Expressed in Lymphoid Tissues (RELT) is a Tumor Necrosis Factor Receptor family member implicated in several cancers. RELL1 and RELL2 (RELT-Like 1 and 2) are RELT homologs that bind RELT; these proteins are collectively referred to as RELT family members (RELTfms). All three RELTfms can be phosphorylated by the OXSR1 kinase. We sought to test whether RELTfm expression causes death and sensitizes breast cancer cells to chemotherapeutic agents, and whether RELT-induced death is dependent on OXSR1 binding. Furthermore, we tested whether RELT expression is altered in human tumors.
**Methods:** Empty vector (negative control) or expression plasmids for RELTfms were transiently transfected into MDA-MB-231 (231) breast cancer cells with Lipofectamine. A Caspase-Glo 3/7 luciferase assay was used to quantify Caspase-3 cleavage in 231 cells. Flow cytometry (FC) was used to quantify expression of apoptotic markers AnnexinV/PI in 231 cells treated with Doxorubicin or Paclitaxel. An X-Gal morphology assay was used to assess RELT's ability to induce apoptosis with a mutated binding site (RARA) for the OXSR1 kinase. Immunohistochemistry (IHC) was utilized to assess RELT upregulation in human breast and colorectal cancer biopsies.
**Results:** RELTfm overexpression induced apoptosis in 231 cells based on FC and X-gal staining, yet RELT overexpression did not result in Caspase-3 cleavage in 231 cells. FC revealed increased apoptosis and necrosis following chemotherapy treatment in 231s overexpressing RELL2 compared to vector. X-Gal staining revealed RELT and RARA had similar enhancement of apoptosis versus empty vector. IHC results demonstrated increased RELT expression in malignant breast cancer biopsies compared to patient-matched benign tissue. Interestingly, RELT was localized in the cytoplasm of malignant cancer cells, versus in the nucleus of benign cells.
**Conclusion:** RELT and RELL2 induce apoptosis in breast cancer cells and RELL2 enhances the sensitivity of these cells to chemotherapeutic agents. Phosphorylation of RELT by OXSR1 is not required to induce death in 231 cells. Interestingly, RELT expression and cellular localization is altered in human breast cancer biopsies compared to benign tissue, indicating a potential key role for RELT in breast cancer that warrants further investigation.

**Abstract # A2**

**Type of presentation: Poster**

**Authors:** Jessica Ran[1], Preny Karamian[1], Zoe Robinow[1], Forshing Lui[1], and David Gonda[2]
[1]College of Medicine, California Northstate University.
[2]University of California, San Diego

**Title:** Anterolateral Thoracic Myelomeningocele with Split Cord Malformation

**Introduction:** Spina bifida (SB) is a congenital neurological disorder where there is a failure of neural tube closure during the 17-30th days of fetal development resulting in a defect of vertebral arches. Myelomeningocele (MMC) is the most severe form of SB where the meninges and spinal cord protrude out of a vertebral opening as a sac. Lateral, anterior, or anterolateral MMC is much rarer than posterior MMC. Patients with lateral meningoceles can be asymptomatic, or present with paraparesis, pain due to involvement of the spinal cord, or cough or dyspnea due to compression of chest structures. Rarely, MMCs present with spinal cord malformations such as a split cord or with the spinal cord tethered to the skin or meninges.
**Case Presentation:** We present a case of a 2-year-old boy with a history of congenital scoliosis and lateral thoracic MMC. He was able to walk and run but his parents reported left leg weakness and a frequent cough. On physical exam, he was neurologically intact with normal gait, motor function, and reflexes. MRI of the spine without contrast showed left convex upper thoracic congenital scoliosis and rightward anterolateral MMC inferiorly to T3, with the spinal cord tethered at this location. Surgery was planned because of concern that the patient's MMC was causing tethering and contributing to progression of his scoliosis and left leg weakness, as well as his cough. Neurosurgical cord detethering and repair of MMC were performed simultaneously with scoliosis repair by orthopedics. During the dissection of the MMC, the bulging neural tissue was found to be a split cord ending in a blind stump. The split cord was determined to be nonfunctional, and bipolar electrocautery followed by sharp dissection was used to detether the cord. Detethering was followed by repair of the dural outpouching and dural closure. The surgery was successful, and the patient was taken to the PICU in stable condition.
**Discussion:** This case illustrates the diagnosis and treatment of a rare case of anterolateral thoracic MMC with a split cord malformation in the setting of congenital scoliosis

**Abstract # A3**

**Type of presentation: Poster**

**Authors:** Jenna D Hakel[1], Thomas P Gasbeck[1], and Valerie Gerriets[1]
[1]College of Medicine, California Northstate University

**Title:** Perceived Stress in Female Medical Students Pursuing Male-Dominated vs. Female Dominated Surgical Specialties

**Introduction:** Women constitute a majority of medical school students, yet they are historically underrepresented in medicine, most notably in surgery, which is an overwhelmingly male-dominated specialty (MDS). Studies have shown that women in MDS have poorer mental health outcomes compared to those in female-dominated specialties (FDS), significantly attributable to workplace gender discrimination. Further studies demonstrated that this inequity is present as early as premedical education. We sought to investigate whether gender inequity in medical students has adverse effects on stress perceived by women pursuing MDS. We hypothesize that female medical students interested in MDS experience higher levels of stress compared to their colleagues.
**Methods:** We conducted a case-control study using survey responses from 251 medical students that assessed students' stress levels and intended specialties. Stress was quantified on a 0-40 scale using students' responses to the Perceived Stress Scale (PSS-10) questionnaire. Students were grouped according to gender and interest in FDS (OBGYN), MDS (all other surgical specialties), or lack of interest in a surgical specialty. Average PSS-10 scores were calculated for the sample groups and compared using a two-tailed t-test.
**Results:** Among the 251 survey responses, the 18 female students interested in MDS had a mean PSS-10 score of 18.39, rated as moderate stress. Females pursuing MDS demonstrated a marginal +0.08 difference in stress levels relative to females pursuing FDS ($\bar{x}$=18.31), which was determined not statistically significant (p=0.96).
**Conclusions:** While prior publications have demonstrated that female surgical residents in MDS experience higher levels of stress than their male counterparts, this effect was not replicated for our medical students. With nearly equivalent PSS-10 stress scores, the survey data yielded minimal differences in stress levels between female subjects pursuing MDS or FDS, suggesting that these gendered differences in mental health are not present prior to the onset of surgical training. More research is needed to determine which factors specific to residency training are associated with increased stress for female trainees in MDS.

**Abstract # A4**

**Type of presentation: Poster**

**Authors:** Veronica Gandara[1], Mark Bondi[2,3], Jeremy Elman[2], William Kremen[2], David Salmon[2], Jason Holden[2], Alexandra Weigand[2], Seraphina Solders[2], Peter Link[2], and Eric Granholm[2,3]
[1]California Northstate University College of Medicine
[2]University of California, San Diego
[3]Veterans Affairs San Diego Healthcare System

**Title:** Pupillary responses during verbal fluency tasks as a biomarker of risk for Alzheimer's disease

**Objective:** We examined the use of pupillometry as an early risk marker of Alzheimer's disease (AD). Pupil dilation during a cognitive task has been shown to be an index of cognitive effort and may provide a marker of early change in cognition even before performance begins to decline. Individuals who require more effort to successfully perform a task may be closer to decline. Task evoked pupil dilation is linked to increased norepinephrine output from the locus coeruleus (LC), a structure affected early in the AD pathological process. In this study, we measured pupil dilation during verbal fluency tasks in participants with aMCI or naMCI, and cognitively normal (CN) individuals. We hypothesized that participants with aMCI would show greater compensatory cognitive effort than the other two groups.
**Method:** This study included 101 older adults without dementia recruited from the UC San Diego Shiley-Marcos Alzheimer's Disease Research Center(mean [SD] age = 74.7 [5.8]; education = 16.6 [2.5]; N=58 female); 62 CN, 20 aMCI and 19 naMCI participants. Pupillary responses were recorded at 30 Hz using a Tobii X2-30during semantic (animals, fruits, vegetables) and phonemic (letters F, A, S) fluency tasks. Participants generated as many words as possible in a category or starting with a given letter in 60 seconds.
**Results:** Repeated measures ANOVA (3 groups X 2 fluency conditions) with age, education and sex as covariates showed a significant main effect of group ($F(2,95)=3.64$, $p=.03$), but no group X condition interaction ($F<1$). Pairwise comparisons showed significantly greater fluency task-evoked dilation for aMCI relative to CN ($p=.015$) and naMCI ($p=.019$) participants. When controlling for performance (total letter or category words produced), pupil dilation (cognitive effort) remained significantly greater in aMCI relative to the other two groups in both fluency conditions, suggesting pupil dilation informs risk beyond information provided by task performance.
**Conclusion:** Significantly greater pupil dilation was found in individuals with aMCI on verbal fluency tasks, indicating greater compensatory cognitive effort to maintain performance. Pupillometry provides a promising biomarker that might be used as an inexpensive and noninvasive additional screening tool for risk of AD.

**Abstract # A5**

**Type of presentation: Poster**

**Authors:** Authors: Stevyndennis Onggo[1], Rita Chang[1], Aditi Singh[2], Katelynn Lopez[3], Lily Chen[4], and Mina Hah[3, 5]
[1]California Northstate University College of Medicine
[2]California Northstate University College of Health Sciences
[3]Synapse Association
[4]UC Davis Health, Dept. of Cardiovascular Medicine
[5]UC Davis School of Medicine, Dept. of Psychiatry

**Title:** Pericarditis associated with Aripiprazole

**Introduction:** Pericarditis is an inflammation of the pericardial sac and can occur from multiple etiologies. The diagnosis of an acute pericarditis requires at least two of the following criteria: non-ischemic chest pain, pericardial friction rub on auscultation, ST deviation or PR depression on ECG, and echocardiography of a pericardial effusion. In literature, pericarditis has only been linked to the atypical antipsychotics clozapine and quetiapine.
**Case Presentation:** A 28-year-old man with a history of bipolar disorder was treated with aripiprazole and developed pericarditis. The patient had a previous history of pericarditis of unknown etiology that occurred 4 years prior to initiating aripiprazole therapy. The second episode of pericarditis remitted soon after discontinuing aripiprazole. Three months later, a decision was made for a rechallenge of aripiprazole as the patient's bipolar symptoms did not have a satisfactory response to other treatment regimens. Less than a month after restarting aripiprazole, the patient developed pericarditis symptoms again. The patient did not have any symptoms of pericarditis since discontinuing aripiprazole. He presents with a score of +9 using the Naranjo Adverse Drug Reaction scale, which corresponds with a definite ADR.
**Discussion:** While aripiprazole is associated with an array of serious side effects, there are no reported cases of aripiprazole mediated pericarditis. Previous literature demonstrates patients with clozapine and quetiapine associated pericarditis that did not develop pericarditis with aripiprazole treatment. However, based on our case report, aripiprazole can be an independent etiology for pericarditis even if it is a safer alternative to clozapine and quetiapine. It is important to be aware of this potential adverse outcome and to discontinue the medication if pericarditis symptoms arise. Future research needs to be conducted to see if other antipsychotic medications increase the risk of pericarditis.

**Abstract # A6**

**Type of presentation: Poster**

**Authors:** Nancy Le[1], Anand Dhaliwal[1], Taylor Ngo[1], Anhtho Tong[1], and Biljinder Chima[2]
[1]College of Medicine, California Northstate University
[2]Rocklin Family Practice & Sports Medicine

**Title:** The Misdiagnosis of Diabetes Mellitus in Stiff Person Syndrome: A Case Report

**Introduction:** Stiff person syndrome (SPS) is a rare autoimmune neurological disorder, characterized by muscular rigidity and episodic spasms. SPS is often linked to type 1 diabetes mellitus (T1DM), as both share anti-glutamic acid decarboxylase (anti-GAD) autoantibodies. On average, SPS is diagnosed mid-to-late adulthood, while that of T1DM is early childhood. As such, adult patients with late-onset diabetes and symptoms aligned with SPS can be misdiagnosed with T2DM for T1DM, which has salient implications for treatment. We present a 66-year-old patient with concurrent SPS and T1DM, which was previously diagnosed and treated as T2DM.
**Case Presentation:** A 66-year-old male presented to his PCP for anxiety and panic attacks. He was diagnosed with T2DM at age 56 and prescribed metformin as initial treatment. However, due to persistent elevated hemoglobin A1C, he was prescribed Empagliflozin insulin. After two years, the patient complained of fatigue and muscle aches caused by lactic acidosis secondary to metformin use. He discontinued metformin but continued to report neurological and muscle symptoms. The patient was referred to an endocrinologist due to increasing HgA1C and was tested for anti-GAD Ab in suspicion of T1DM. Results yielded a GAD65 score of 9 (normal <5). The patient's diabetic status was changed from T2DM to T1DM, and he was diagnosed with SPS in alignment with his muscle symptoms.
**Discussion:** The link between Stiff Person Syndrome and diabetes is shared by the presence of autoantibodies to GAD. Differentiating between T1DM and T2DM has important implications for determining appropriate pharmacological management. Our patient was initially prescribed Empagliflozin for blood glucose control; however, this medication is contraindicated for patients with type 1 diabetes because of its increased risk of causing diabetic ketoacidosis. Moreover, the patient's muscle symptoms were initially attributed to lactic acidosis secondary to metformin use, which was later explained by an SPS diagnosis.

**Abstract # A7**

**Type of presentation: Poster**

**Authors:** Daniel Razick[1], Muzammil Akhtar[1], Anand Dhaliwal[1], and Biljinder Chima[2]
[1]College of Medicine, California Northstate University
[2]Sutter Medical Network

**Title:** A Case Report of Hydropneumothorax as a Presentation of Birt-Hogg-Dubé Syndrome

**Introduction:** Birt-Hogg-Dubé (BHD) syndrome is a rare genetic disorder characterized by spontaneous pneumothorax, benign skin lesions, and an increased risk of developing renal cancer. Diagnosis is commonly made through genetic testing, physical examination, and imaging studies. Interestingly, only 200 families worldwide have been identified as having BHD syndrome. We present a unique case in which a combination of multiple chronic illnesses and significant family history led to a diagnosis of BHD syndrome.
**Methods:** The patient's past medical history, physical exam findings, diagnostic tests, and laboratory values were evaluated to make an accurate diagnosis of BHD syndrome.
**Results:** Nine months ago, a 72-year-old male patient presented to their primary care physician with a persistent cough of four months and was admitted to the emergency department after the discovery of a left hydropneumothorax which required placement of a chest tube. The patient's medical history was significant for recurrent spontaneous bilateral pneumothorax diagnosed over 20 years ago, chronic obstructive pulmonary disease (COPD), right renal mass concerning renal cell carcinoma, and many other systemic illnesses. Additionally, the patient's mother had a history of lung cancer and their father had a history of emphysema. A combination of the patient's significant past medical and family history led to a diagnosis of BHD syndrome.
**Conclusion:** BHD syndrome commonly presents with a combination of cutaneous, pulmonary, and renal involvement. Despite benign skin lesions known as fibrofolliculomas being the most common finding, they are not always present, as seen in our case, which can result in missed diagnosis. Due to the autosomal dominant nature of BHD syndrome, it is vital to make an accurate diagnosis to allow for proper genetic counseling, as the development of renal cancer is the leading cause of mortality.

**Abstract # A8**

**Type of presentation: Poster**

**Authors:** Arya Asghari[1], Alex Jiang[1], Gagandeep Singh[1], Dorsa Heydarlou[1], and Jose Puglisi[1]
[1]California Northstate University, College of Medicine, Elk Grove, California

**Title:** Personalized Topical Applicator Using 3D Imaging and Printing in Treating Tinea Pedis

**Background:** Tinea pedis, also called athlete's foot, is a dermatophyte infection affecting the soles, interdigital clefts of toes, and nails of the feet. Infections can be chronic or recurrent in nature, and often range in severity, which determines the course of therapy. As the population continues to age, fungal foot infections are becoming a large and increasingly common public health concern. For these reasons, a more comprehensive and optimized treatment protocol is required to treat fungal foot infections. This study aims to explore the utility of three-dimensional (3D) scanning and printing technology, and to assess whether it can be used to develop personalized applicators for topical solutions in treating tinea pedis.
**Methods:** A protocol was developed to outline the process of obtaining scans and generating a hollow 3D-printed model of the phalanges, resembling a therapeutic applicator for treating tinea pedis. The Creality CR-Scan 01 portable scanner and Creality 3D Ender Printer were utilized to obtain 3D scans of a silicone model foot and to print 3D models of them using an ABS (acrylonitrile butadiene styrene) filament. Creality CR Studio 2.0, Visual Studio, and Autodesk Meshmixer softwares were used to align, slice, and modify scans, respectively. The protocol was confirmed and qualitatively assessed.
**Results:** The 3D dressing was printed and successfully placed on the silicone model foot. Through positioning the scanner at a 30-45° above the flat surface holding the object being scanned, while ensuring a dimly lit room and dark background, optimal scans were generated. For the printed applicator, scaling of 10-20% greater than the original size was determined to provide optimal comfort and coverage of the phalanges.
**Conclusion:** We demonstrate the utility of this protocol and 3D imaging technology for designing and printing personalized applicators. Future work should focus on creating applicators offering flexibility in design, material, and application with topical therapeutics for treating tinea pedis.

**Abstract # A9**

**Type of presentation: Poster**

**Authors:** Amir Bakhshi[1], Nabeal Dean[1], Aleksandar Toshich[1], and Nalin Ranasinghe[1],
Leonard Ranasinghe[1]
[1]College of Medicine, California Northstate University

**Title:** Pneumocephalus clinical presentation in the emergency department

**Introduction**: A 65 year old male presented to the emergency department with a rare case of infectious pneumocephalus. Patient was febrile with a two day history of headache and vomiting, standard clinical presentations of pneumocephalus. CSF rhinorrhea was induced upon the patient leaning forward. A CT of the brain showed diffuse pneumocephalus of the subarachnoid space. Patient was administered antibiotic treatment then transferred to neurosurgery for management of CSF leak. Etiology of pneumocephalus predominantly involves craniofacial trauma, malignancies of the central nervous system, post operative iatrogenic causes, and rarely can occur spontaneously via idiopathic mechanisms. Factors that have been correlated with an increased likelihood of pneumocephalus include duration of neurosurgical procedures, patient positioning during neurosurgical procedures, neoplasms, infections, epidural anesthesia, spinal anesthesia, hyperventilation, intracranial lumbar drains, intraoperative osmotherapy, usage of nitrous oxide as an anesthetic, and barotrauma.
**Methods:** We conducted a review of this patient's case as well as literature concerning other presentations of pneumocephalus to develop a report on this case of infectious pneumocephalus. In this case report we review a patient's treatment timeline, analyze patient imaging, and evaluate the presentation of symptoms.
**Conclusion:** This patient presents with a rare case pneumocephalus which gives us the opportunity to show that pneumocephalus should be considered in presentations other than the common etiologies like trauma or post-surgical.

**Abstract # A10**

**Type of presentation: Poster**

**Authors:** Ellis Jang[1], Johnson Thai[1], Thien Nguyen[1], and Jose Luis Puglisi[2]
[1]Second-year Medical Student, California Northstate University College of Medicine, Elk Grove, CA, USA
[2]Associate Professor of Physiology and Biostatistics, Faculty Advisor, California Northstate University College of Medicine, Elk Grove, CA, USA

**Title:** Use of Alcohol, Tobacco, and Drugs in Lesbian, Gay, and Bisexual Persons: Implications for Substance Use Disorders Among Sexual Minorities

**Introduction:** Lesbian, gay, bisexual, transgender, queer or questioning (LGBTQ) persons are at higher risk for substance abuse and addiction compared to heterosexual persons. As a result of social stigma, discrimination, harassment, and healthcare disparities that surround their sexual minority status, LGBTQ individuals are more likely to use alcohol, tobacco cigarettes, and drugs than the sexual majority. Therefore, this study aims to evaluate the rates and trends of substance use disorders (SUDs) and substance abuse in the sexual minority population from 2015 to 2020.
**Methods:** We used the IBM SPSS Statistics 29.0 software to analyze datasets from the 2015 to 2020 National Survey on Drug Use and Health, an annual nationwide survey on substance use and mental health. DSM-5 criteria for alcohol, tobacco, and cannabis use disorders as well as self-reported drug abuse (e.g. prescription opioid misuse, prescription drug misuse other than opioids, and illicit drug use) were used to evaluate for statistically significant differences in SUDs and substance abuse between lesbian, gay, and bisexual (LGB) and heterosexual groups, including youth (age 12-25) and adult (age 26+) subgroups. Chi-square tests with a p-value less than 0.05 were considered to be statistically significant.
**Results:** With an average of 2,940 LGB and 36,417 heterosexual survey respondents from 2015 to 2020, the sexual minority population had significantly higher rates of alcohol (27.6% vs 11.7%), tobacco (16.9% vs 11.1%), and cannabis use disorders (CUD) (7.0% vs 1.7%), prescription opioid misuse (9.2% vs 4.2%), prescription drug misuse besides opioids (11.6% vs 5.0%), and illicit drug use (10.8% vs 2.7%) compared to the sexual majority. Youth LGB and heterosexual individuals had higher rates of CUD, prescription drug misuse, and illicit drug use compared to their adult counterparts. P-values are less than 0.001 for all cases.
**Conclusions:** Sexual minorities reported disproportionately higher rates of substance abuse and addiction than the sexual majority from 2015 to 2020. Thus, it remains imperative that health policy prioritizes LGBTQ+ tailored SUD treatment programs in order to provide specialized services to address the complex roots of substance abuse in sexual minority groups.

**Abstract # A11**

**Type of presentation: Poster**

**Authors:** Amy Patel[1], Matthew Hyer[1], Dorsa Heydarlou[1], Anna Thiemann[1], Mohammed Kayali,[2] and Leonard Ranasinghe[3]
[1]California Northstate University, College of Medicine, Elk Grove, CA
[2]Associate Medical Director, Dignity Woodland Memorial Hospital, Woodland, California
[3]Professor and Clerkship Director of Emergency Medicine, California Northstate University College of Medicine, Elk Grove, California

**Title:** A Rare Case of Pediatric Osteomyelitis

**Introduction:** Osteomyelitis is commonly caused by Staphylococcus aureus infection. Although rare in children, it affects long bones, such as those in the arms or legs, by spreading through blood or tissue.

**Case Description:** A 10-year-old male presented to the emergency department with 4 days of right clavicular pain that increased with right arm elevation or with pressure applied to the affected area. Patient was otherwise healthy and did not report prior trauma. Lab results showed elevated absolute neutrophils, glucose, total protein, ESR, and reduced sodium. Soft tissue appeared normal and an X-ray of the right clavicle was unremarkable for fracture, dislocation, or erosion. A diagnosis of contusion/sprain lead to discharge and patient was given ibuprofen. Patient was advised to return for a follow up within 3-5 days but returned to the emergency department two days later. He presented with increased pain, fever, chills, altered level of consciousness, and swelling in the right clavicular and chest area. Physical exam revealed decreased range of motion of the right arm and neurological deficits. Laboratory testing had elevated white blood cell count, absolute neutrophils, total protein and decreased hematocrit, sodium and carbon dioxide. Microbiology tests were negative. Chest CT with contrast revealed osteomyelitis/cellulitis of the chest wall and right axilla with occlusion of the right subclavian vein. Patient was treated with pain relievers and IV antibiotics. A diagnosis of methicillinsensitive Staphylococcus aureus infection causing osteomyelitis of the rib and chest wall was made. Patient was given Tylenol, stabilized, and transferred for admittance at a hospital where he underwent surgical drainage. He was discharged 6 days later, on an oral antibiotic. He did not display signs of distress or confusion 4 days later at follow up. He was prescribed a topical antibiotic and counseled on care of small skin infections. Patient returned, 3 days later, for follow up, showing further signs of improvement.
**Discussion:** This case illuminates a rare presentation of osteomyelitis in the rib of a pediatric patient who also had unique neurological symptoms. Recognizing the signs and symptoms of these rare instances of osteomyelitis may lead to earlier detection and diagnosis.

**Abstract # A12**

**Type of presentation: Poster**

**Authors:** Gursimran Singh[1], Dilpreet Singh[2], Rajendra Ramsamooj[1], and Prabhu Shankar[2]
[1]California Northstate University College of Medicine
[2]University of California Davis College of Medicine

**Title:** An Assessment on the Prevalence of Depression and Anxiety in Punjabi Adolescents in the Central Valley region of California

**Introduction**: The prevalence of mental health conditions among adolescents has been shown to be 14% worldwide, yet these conditions frequently go undiagnosed and untreated.[18] Similarly, depression and anxiety in Punjabi Adolescents have not been adequately explored, as past studies that shed light upon the increased mental health disparities in immigrant South Asian populations focus on adults.
**Methods:** In order to remedy this, a cross-sectional study was conducted using validated survey tools (PHQ-9 and GAD-7) to assess whether there is a high prevalence of depression and anxiety in this adolescent population of interest when compared to the overall adolescent population (ages 12-17) in the United States.[19] This study took place in the Central Valley of California, a region where a dense population of the Punjabi diaspora can be found. PHQ-9 and GAD-7 (Depression and anxiety respectively) were incorporated into an anonymous survey and the survey was administered through Qualtrics software for High School students to complete with the consent of their Parent/Guardian.
**Results**: 67 complete responses were obtained and an mean GAD-7 score of 8.06 was reported. This translates to the average participant having mild anxiety. A mean PHQ-9 score of 9.13 was obtained, which indicated that the average participant has symptoms of mild depression.
**Conclusion**: This project will help shed light on the severity of the issue in this underserved minority population of California where the adolescent population is suffering depression and anxiety at a disproportionate rate. Additionally, the findings from this study can be utilized to create resources and interventions to alleviate the various burdens of mental health conditions faced by the adolescent population. While this project assesses whether there is an increased prevalence of depression and anxiety in Punjabi adolescents, it can also be utilized as a stepping stone for future studies to explore the contributory factors for these two mental health disparities, if they are discovered.

**Abstract # A13**

**Type of presentation: Poster**

**Authors:** Nadine Horneck[1], Xochitl Bryson[2], Nicole Segovia[2], Ann Richey[2], Hiba Naz[2], Nadine Javier[2], Kali Tileston[2], and John Vorhies[2]
[1]College of Medicine, California Northstate University.
[2]Department of Orthopaedic Surgery, Stanford Medicine

**Title:** Identifying Brace Compliance Trends in Adolescent Idiopathic Scoliosis

**Introduction**: Scoliosis is a 3D spinal deformity that is reported in about 3% of children younger than 16. Full-time brace wear (18hrs/day) is prescribed for curvatures greater than 20-40 degrees. Although adherence to bracing has a 72% success rate of preventing surgery, compliance is variable and children sometimes only achieve 10% of the recommended time. We sought to identify a subset of patients that struggle with brace wear and describe statistical patterns associated with brace wear compliance. These trends will be analyzed and used to develop new measures to target better brace wear adherence.
**Methods**: We conducted a retrospective cohort study of 62 patients (ages 6-17) being treated for idiopathic scoliosis at Stanford Children's Health. PROMIS surveys were used to assess patient reported outcomes of physical, emotional, and social quality of life. A mixed-effects logistic regression model was used to estimate the effects of gender, age, time from brace prescription, weekends, and seasons on a patient's odds of achieving their prescribed brace wear, as measured by Thermochron compliance monitors. An analysis of variance test and Fisher's exact test were used to analyze demographic differences between patient compliance pattern groups.
**Results**: Brace wear patterns (BWPs) among the 62 patients displayed 26 (42%) with a decrease in hours worn daily, 17 (27%) consistent (mean <18 hours), 7 (11%) increasing, and 12 (19%) consistent (mean >18 hours). Analyzing age as a compliance factor revealed decreasing BWPs in older children and increasing BWPs in younger children. Increasing age was associated with decreased odds of compliance; odds ratio (OR)=0.60 (95% CI 0.40-0.90). Increased months since brace prescription had decreased odds of compliance OR=0.92 (95% CI 0.92-0.93), and weekends had decreased odds of compliance OR=0.84 (95% CI 0.77-0.92). Relative to summer months, fall, spring, and winter lead to increased odds of compliance, OR=1.22 (95% CI 1.09-1.36), 1.21 (95% CI 1.07-1.35), and 1.37 (95% CI 1.22-1.54) respectively.
**Conclusions**: Older age, longer time since brace prescription, and weekends are compliance risk factors with a lower likelihood of achieving 18hrs of brace wear. Fall, spring, and winter months had a greater likelihood of achieving 18hrs of brace wear than summer months. Further analysis with MOBI surveys are currently underway.

**Abstract # A14**

**Type of presentation: Poster**

**Authors:** Mitchell Hee[1], Shaheen Sultana[2], and Glenn Yiu[2]
[1]California Northstate University College of Medicine
[2]University of California, Davis

**Title:** Exploring cell-specific gene expression changes in a mouse model of neovascular age-related macular degeneration

**Introduction:** Anti-vascular endothelial growth factor (anti-VEGF) revolutionized the treatment for neovascular age-related macular degeneration (AMD); However, persistent disease activity affects up to 50% of patients and suboptimal vision recovery affects over 60% of patients treated with anti-VEGF therapy. Our project aims to explore the cell-specific gene expression changes in a mouse model of neovascular AMD to identify pathologically relevant cell types and discover novel angiogenic factors, so that more targeted therapies can be developed.
**Methods:** Six wildtype mice were bred for this experiment, and each mouse had one eye undergo laser choroidal neovascularization (LCNV) treatment to simulate neovascular AMD while the untreated eyes were used as a control. One week after treatment, the ocular tissues were harvested and sent to the UC Davis genome center for single-cell RNA sequencing, and the sequencing data was then analyzed in R Studio using Seurat 4.0.
**Results:** The sequencing data of approximately 20,000 cells were organized using a uniform manifold approximation and projection (UMAP) in R Studio and categorized into 13 ocular cell types based on their gene expression profiles. Differential expression analyses were then conducted to differentiate the transcriptomic profiles of each cell based on its condition (LCNV or control) and cell type using expression plotting tools such as violin plots, volcano plots, and heatmaps. While multiple cell types showed increased expression of known angiogenic markers in the LCNV condition, markedly elevated levels of angiogenic markers were seen in the amacrine, fibroblast, and pericyte cell populations. In addition, pericytes demonstrated a unique increase in Angpt1 and Angpt2 expression in the LCNV condition.
**Conclusion:** Our findings suggest that amacrine cells, fibroblasts, and pericytes are the pathologically relevant cell types involved in neovascular AMD. Pericytes appear especially involved by their unique expression of angiopoietin (Angpt1 and Angpt2) in the LCNV condition. Neovascularization caused through the angiopoietin signaling pathway may explain why certain patients demonstrate an incomplete response to anti-VEGF therapy, and we believe that an adjunct therapy targeting pericytes or angiopoietin may improve clinical outcomes.

**Abstract # A15**

**Type of presentation: Poster**

**Authors:** Brian Gao[1], Himanshu Wagh[1], Allen Dang[1], Mark Reed[1], and Valerie Gerriets[1]
[1]College of Medicine, California Northstate University.

**Title:** Assessing the Relationship Between Student Wellness Activities and The Mental Health of Medical Students

**Introduction:** Medical students routinely suffer from stress, depression, and anxiety, which can adversely affect their academic performance and quality of life. Medical schools employ methods such as organizing wellness events to improve the mental health of students. This study investigates the correlation between wellness event participation and student-reported stress, depression, and anxiety scores to reflect on the efficacy of current programs in nurturing student success.
**Methods:** California Northstate University College of Medicine (CNUCOM) medical students were anonymously surveyed using PSS-10, PHQ-9, and GAD-7 questionnaires, which score the students' perceived stress, depression, and anxiety levels respectively on standardized scales. Student participation in wellness activities were gauged in three categories: did not attend, attended, or attended and helped organize. Relationships between degree of participation in wellness events and wellness scores were investigated through a series of two-sample, two-tailed t-tests with equal variance.
**Results:** 273 medical students participated in the survey, of which 251 reported their involvement in wellness activities and were included in the analysis. 110 students did not attend wellness events, 97 attended, and 44 attended and helped organize. The average PSS10 scores were 15.5, 15.8, and 17.5 respectively, the average PHQ9 scores were 5.03, 4.82, and 5.39 respectively, and the average GAD7 scores were 4.29, 4.58, and 5.45 respectively. Across all students, the average PSS10, PHQ9, and GAD7 scores were 16.0, 5.01, and 4.61 respectively, correlating to moderate stress, mild depression, and mild anxiety levels. Differences in PSS10, PHQ9, and GAD7 scores were not statistically significant ($p>0.05$) for all students regardless of wellness event participation level.
**Conclusions:** The degree of wellness event participation was not a significant factor in student reported PSS10, PHQ9, and GAD7 scores at CNUCOM. This may suggest that student well-being is multifactorial, and further research is needed to develop wellness interventions that promote student mental health.

**Abstract # A16**

**Authors:** Antoine Ganivet[1], Caroline Goswami[1], Angela Penney[1], Thien Nguyen[1], Leonard Ranasinghe[1], and Arthur Jey[2]
[1]College of Medicine, California Northstate University
[2]Sutter Roseville Medical Center

**Title:** Evaluation of California Senate Bill 1152: "Dignity in Discharge"

**Introduction:** Homeless individuals face greater health inequalities and are subject to shorter life expectancy, higher morbidity, and greater usage of acute hospital resources such as the emergency department. Policymakers at the California Senate legislative level proposed and passed Senate Bill (SB) 1152 in mid-2018, and it was signed into law by the governor on September 30, 2018. The purpose of this study is to conduct a quality improvement project of Sutter Medical Center Sacramento (SMCS) Emergency Department for this SB 1152 and analyze the degree of successful implementation and completion. This study was approved by the institutional review board at Sutter Medical Center Sacramento. All data was de-identified to protect patient privacy.
**Methods:** The "Homeless Checklist" discharge flow sheet mandated by SB 1152 is comprised of 8 sections as listed below: Screened for behavioral health follow up (BHFU), Screened for medical follow-up (MFU), Screened for community resource recommendations (CR), Meal offered (MO), Weather appropriated clothing provided (CR), Prescriptions (Rx), Discharge destination (DD), Transportation offered at discharge (TO)
The Electronic Medical Records (EMR) for 20,180 Emergency Department (ED) visits to SMCS from June 1st, 2019 to August 31st, 2022 was queried by an Ad Hoc reporting team, extracting the flow sheet responses from each category for each encounter. We then used Microsoft Excel pivot tables to convert the categorical flow sheet responses into "YES" for any completion and "NO" for no completion, allowing us to quantify the percentage of completed flow sheets to total encounters for each year. An SMCS data analyst was also given the data and provided us with month-by-month completion percentages for the whole study period.
**Results:** From the encounters between June 2019 to August 2022, when examining all mentioned factors and implementing SB1152 Protocol in the Sutter Sacramento Emergency Department, the overall compliance rate of this questionnaire based on the eight categories were between 83.0% and 83.2%, and this included simple completion of the form whether it be selected as not indicated, patient declined, and/or accepted.
**Conclusion:** Ultimately, this 17% discrepancy requires further investigation but may be related to patients' final discharge disposition, particularly related to discharge against medical advice (AMA), hospital admission, or elopement. This study gives rise to potential edits towards the form to increase completion and compliance under SB 1152.

**Abstract # A17**

**Type of presentation: Poster**

**Authors:** Savannah Zemeida[1], Emily Chou[1], Esther Chang[1], Valerie Gerriets[1], and John Cusick[1]
[1]College of Medicine, California Northstate University, Elk Grove, CA

**Title:** The Efficacy of Flipped Classrooms Over Traditional Didactic Lectures in Medical Education

**Introduction:** Flipped classroom instruction has been gaining popularity in higher education and emerging evidence suggests that this pedagogy may benefit students compared to traditional didactic lectures. In this study we aim to assess the efficacy and viability of implementing a flipped classroom modality in a medical school setting.
**Methods:** Students were randomly placed into different groups that took formative quizzes after exposure to either 1) a traditional didactic lecture, or 2) watching a pre-recorded lecture (voiceover) followed by a review game. A third group served as a blind control and took the quiz prior to being exposed to either pedagogy. We also collected faculty feedback regarding voiceovers and in-class review games. Students participated in a review game covering academic policies and were given pre- and post-quizzes to assess their understanding. A students' t-test was used to determine statistical significance in quiz performance. Survey data for both observing faculty and students that participated in the review game was collected using a Likert scale.
**Results**: Pre-review academic progression policy quiz performance significantly improved ($p = 0.048$) from 51% ($n = 14$) to 67% ($n = 19$) after participating in a review game. In a cohort of second-year medical students, performance after delivery of either pedagogy did not differ significantly ($p = 0.20$), as the voiceover and review game group averaged 65% ($n = 10$), lecture group averaged 71% ($n = 14$), and the blind control group averaged 31% ($n = 9$). Faculty surveyed indicated they would be more willing to create voiceovers if they had training, resources, and IT support (average Likert score of 6.2, out of 7, $n = 9$) and if it resulted in more positive student feedback ($n = 8$).
**Conclusion:** Students that participated in a review game covering academic policies on the first day of medical school instruction scored significantly better in comparison to students that learned the information solely through orientation. Although neither teaching pedagogy resulted in significantly improved performance in this study, the combined use of voiceovers plus review games was positively received by both faculty and students. Furthermore, valuable information from students regarding how to improve the delivery of this pedagogy was received.

**Abstract # A18**

**Type of presentation: Poster**

**Authors:** David Lee[1], Ethan Kwong[1], Trevor Short[1], Austin Qui[1], Sameir A. Alhadi[2], and Leonard Ranasinghe[3]
[1]Second-year medical student, California Northstate University College of Medicine, Elk Grove, California, USA
[2]Emergency Medicine Residency Faculty, St. Agnes Medical Center, Fresno, California, USA
[3]Professor of Emergency Medicine & the Fourth-year Medical Student (M4) Director, California Northstate University College of Medicine, Elk Grove, California, USA

**Title:** A Rare Case of Superior Mesenteric Artery Aneurysm

**Introduction:** Superior mesenteric artery aneurysms (SMAAs) are a rare type of visceral artery aneurysm (VAA) in the abdomen; aneurysms in this region are most often due to abdominal aortic aneurysms. The superior mesenteric artery is a branch of the aorta that supplies the small intestine to the splenic flexure of the large intestine, and an aneurysm of this artery makes up of 3-9% of all visceral artery aneurysm cases [1,10]. Due to the rare nature of SMAAs, the understood causes of SMAAs are changing. Previously, an estimated 60% of SMAAs were thought to be due to mycotic causes; however, recent research suggests that vascular wall degeneration, inflammation of surrounding arteries from pancreatitis, and trauma are more likely the cause [12,1].
**Case Presentation:** A 52-year-old Spanish speaking male with unknown smoking history was brought into the emergency room with a three-day history of severe abdominal pain with radiation to the back. The patient's vital signs included: temperature of 98.4°F (36.9°C), heart rate of 65 bpm, elevated respiratory rate of 28 breaths per minute, and blood pressure of 176/94 mmHg. Gastrointestinal examination revealed soft, moderate to severe epigastric tenderness with guarding. Urine drug screen was positive for methamphetamines. After imaging, the patient was confirmed to have a visceral artery aneurysm in the superior mesenteric artery as well as celiac artery stenosis. Upon consultation with a vascular surgeon, surgical repair of the SMAA was requested. An endovascular approach through a femoral access was performed and a GORE® VIABAHN® VBX balloon expandable stent (8 mm x 59 mm) was deployed in the proximal SMA.
**Discussion:** This case should contribute to the body of knowledge surrounding SMAAs due to the general rarity of SMAAs and the circumstances of the patient.

**Abstract # A19**

**Type of presentation: Poster**

**Authors:** Harikumara Kathi[1], Lily Xu, MPH[1], Amy Dao[1], Stephen Lai[1], Arjavon Talebzadeh[1], Zachary Nicholas[1], Reshmika Ramesh[1], Elcin (Sequoia) Halloran[1], Caitlin Mcgrath[1], and Valerie Gerriets[1]
[1]College of Medicine, California Northstate University

**Title:** The effect of Senate Bill-159 on the provision of HIV Pre- and Post-Exposure prophylaxis in Sacramento, California

**Introduction:** Senate Bill (SB)-159 was passed in May, 2019 and allows California pharmacies to provide HIV pre-exposure (PrEP) & post-exposure prophylaxis (PEP) to patients without a prescription. This study investigates Sacramento pharmacies' familiarity with SB-159, its progress over the past three years, and seeks to elucidate possible avenues for further improvement in SB-159 implementation**.**
**Methods:** This study reports findings from surveys of state-licensed pharmacies in Sacramento conducted in 2020-2021 (Year 1), 2021-2022 (Year 2), and 2022-2023 (Year 3) using an IRB-approved script. We assessed a pharmacy's familiarity with SB-159 and identified pharmacies as PrEP/PEP carriers or non-carriers. Summary statistics were generated with Microsoft Excel and R studio. Z tests were used to compare between groups with an alpha = 0.05.
**Results:** In Year 1, 14% of surveyed pharmacies reported carrying PrEP/PEP. In Year 2, 33% maintained stock, and in Year 3, this increased to 62%. For SB-159 familiarity, 30% of the pharmacies surveyed in Year 1 reported familiarity, which increased significantly in Year 2 and Year 3 to 62% and 59%, respectively. Finally, we found that 10% of pharmacies in Year 1 stated they advertise the ability to obtain PrEP/PEP without a prescription, while this decreased to 8.62% in Year 2, and 2.56% in Year 3.
**Conclusions:** Compared to Year 1, there was an increase in the percent of Year 2 and Year 3 pharmacies surveyed that were familiar with SB-159 and stocked PrEP/PEP. However, the data shows that carriers and non-carriers have similar responses to questions related to advertising prophylaxis services. Taken together, this would suggest that SB-159 has increased access to HIV PrEP/PEP, yet has not significantly improved pharmacy advertising. A possible explanation could be pharmacies prioritizing COVID 19 vaccination efforts. Future studies should follow up with pharmacies that plan to implement training for their staff to dispense PrEP/PEP.

**Abstract # A20**

**Type of presentation: Poster**

**Authors:** Kyle Taing[1], Lawrence Chen[1], and Han-Rong Weng[1]
[1]Department of Basic Sciences, California Northstate University College of Medicine, Elk Grove, CA, USA.

**Title:** Emerging roles of GPR109A in regulation of neuroinflammation in neurological diseases and pain

**Introduction:** Neuroinflammation plays a critical role in the pathological process of multiple neurological disorders and pathological pain conditions. GPR109A, a Gi protein-coupled receptor, has emerged as an important therapeutic target for controlling inflammation in various tissues and organs. In this review, we summarized current data about the role of GPR109A in neuroinflammation. Specifically, we focused on the pharmacological features of GPR109A and signaling pathways used by GPR109A to ameliorate neuroinflammation and symptoms in Alzheimer's disease, Parkinson's disease, multiple sclerosis, stroke, and pathological pain conditions.
**Methods:** PubMed and Google Scholar databases with default settings and no restrictions were used to search the literature in this review. "GPR109A" and each of its aliases ["Acid Receptor 2 (HCAR2)", "Niacin Receptor 1 (NIACR1)", "HM74a", "HM74b", and "PUMA-G"] were used as key words to search the literature regarding the nature of GPR109A on the databases. To obtain the literature specific to the roles of GPR109A in neurological disorders and pain, we searched the databases with "GPR109A" or one of its aliases ["Acid Receptor 2 (HCAR2)", "Niacin Receptor 1 (NIACR1)", "HM74a", "HM74b", and "PUMA-G"] in combination with "Alzheimer's", or "Parkinson's", or "multiple sclerosis", or "stroke", or "ischemia or ischemic", or "Huntington's", or "epilepsy or epileptic", or "neuropathy or neuropathic", or "neuroinflammation or neuroinflammatory", or "cytokine", or "glial", or "astrocyte", or "microglia", or "pain". Since no literature was found regarding the role of GPR109A in Huntington's disease or epilepsy, our review focuses on its role in Alzheimer's disease, Parkinson's disease, multiple sclerosis, stroke, and pathological pain conditions.
**Summary/Conclusions**: Accumulating data have suggested that activation of GPR109A receptors ameliorates symptoms in these neurological disorders and chronic pain via suppressing pro-inflammatory signaling pathways and the production of pro-inflammatory mediators as well as enhancing anti-inflammatory signaling pathways.

**Abstract # A21**

**Type of presentation: Poster**

**Authors:** Mark Reed[1], Himanshu Wagh[1], Yui Seo[1], Brian Gao[1], and Valerie Gerriets[1]
[1]California Northstate University College of Medicine, Elk Grove, CA

**Title:** Examining the Differences in Specialty Interest Between Traditional and Nontraditional Medical Students

**Introduction:** Specialty choice is a crucial decision that medical students face, as career satisfaction is a major contributor to a physician's happiness and level of care. Specialty interests across medical students vary substantially and differ based on lifestyle factors and educational/work background. This study cross-examines differences in specialty interest patterns between non-traditional medical students (NTS) and traditional medical students (TS).
**Methods:** Survey participants were recruited from California Northstate University College of Medicine (CNUCOM). Student participants anonymously reported their living status, marital status, and age. Based on these answers, participants were grouped as nontraditional medical students (NTS) if they met the following criteria: (1) 26 years or older as an MS1/2 or 30 years or older as an MS3/4, (2) married or divorced, and (3) living with a spouse or minor. All other participants who did not meet the above criteria were grouped as TS. Participants were given a weighted score to each specialty category of choice denoted by 1/total number of specialties chosen. NTS and TS responses for specialty interest averages were compared using an unpaired t-test.
**Results:** From the 251 medical students surveyed (147 TS, 104 NTS) from CNUCOM, 9 out of 21 specialties had higher rates of selection among TS and 12 had higher rates of selection among NTS. From the 21 specialties, emergency medicine, neurology, and ophthalmology had higher rates of selection by NTS compared to TS ($p<0.01$). Further, TS were significantly more likely to answer that they have no idea what specialty they want to pursue compared to NTS ($p<0.01$).
**Conclusions:** Analysis of polled results form TS and NTS at CNUCOM delineates that NTS are significantly more likely to state preference for a specialty of choice and to select emergency medicine, neurology, and ophthalmology as specialties as compared to TS.

**Abstract # A22**

**Type of presentation: Poster**

**Authors:** Teza Harrison[1], and Leonard Ranasinghe[1]
[1]College of Medicine, California Northstate University, Elk Grove, California

**Title:** A Review of West Nile Virus

**Introduction**: The West Nile virus is a mosquito-borne virus, belonging to the family of Flaviviridae, that has become increasingly prevalent in the United States over the past two decades. In recent years, West Nile Virus (WNV) has been seen as a major health concern in over 100 countries around the world. According to research conducted by LR Petersen in the Journal of Medical Entomology, WNV is associated with a range of serious illnesses, including meningitis, encephalitis, and flaccid paralysis (Petersen, 2019).
**Methods**: Information in this article was extensively researched by reviewing peer-reviewed publications on PubMed, Google Scholar, Research Gate, PLOS Journals, and CDC. The following terms: West Nile Virus; virology"; "West Nile Virus; clinical features"; "Bird species; West Nile Virus"; "West Nile Virus; genetic diversity"; "West Nile Virus; vaccination"; "West Nile Virus; immunology"; "Microglia; West Nile Virus"; "Globalization; West Nile Virus"; "CD8+ T Cell; West Nile Virus"; "CD8+ T Cell; West Nile Virus"; "Neuronal damage; West Nile Virus"; "Chemokines OR inflammatory cells; West Nile Virus"; "West Nile Virus; ecology"; "West Nile Virus; epidemiology"; "West Nile Virus; lymphocytes OR interferons"; "West Nile Virus; diagnostics"; "West Nile Virus; pathobiology"; "West Nile Virus; treatment and prevention"; "West Nile Virus; association with malaria"; "Global warming effect on transmission OR clinical manifestation; West Nile Virus"; "West Nile Virus; vaccination trial testing"; "West Nile Virus; diagnosis"
**Conclusion**: This review emphasizes new updated and novel information regarding the virology, immunology, ecology, epidemiology, effects of the virus, diagnostics, treatment as well as the best methods for prevention and protection of WNV infection.
It will serve as a steppingstone for prospective research on the associations of malaria incidence with WNV, prevention of WNV through vaccination, impacts of global warming on WNV.

**Abstract # A23**

**Type of presentation: Poster**

**Authors:** Muzammil Akhtar[1], Daniel Razick[1], Anand Dhaliwal[1], Alexander Chiang[1], and Brent E. Van Hoozen[2]
[1]College of Medicine, California Northstate Univeristy
[2]Sutter Roseville Medical Center

**Title:** Cellulitis Caused by an Underlying *E. coli* Infection

**Introduction:** Cellulitis is typically caused by *Streptococcus pyogenes* or *Staphylococcus aureus*, but as seen in this case can also be due to an underlying *Escherichia coli* infection. Though the use of blood cultures or needle aspirakeerthi kurian
tions in the diagnosis of the underlying bacteria involved in cellulitis is often inconclusive, it is sometimes beneficial as seen in this case. Our objective is to present a unique case of cellulitis to highlight the importance of taking a detailed history to allow for proper management misdiagnosis of of the infection.
**Methods:** The patient's past medical history, physical exam findings, diagnostic tests, and laboratory values were evaluated to make an accurate diagnosis of cellulitis caused by *E. coli*.
**Results:** Due to the patient's medical history being significant for chronic graft-versus-host disease and a positive COVID-19 infection, along with many other systemic illnesses, we found it important to take a blood culture to identify the underlying bacteria, which was found to be *E. coli*. Identification of *E. coli* allowed for timely and appropriate management which mitigated the risk of a prolonged infection.
**Conclusion:** This case highlights the importance of taking a detailed history and performing a thorough physical exam when diagnosing cellulitis, as several inflammatory and neoplastic diseases present similarly. Additionally, this will allow for evaluation of whether taking a blood culture may be beneficial in management of the infection. This case also presents possible correlations between COVID-19 and cellulitis, however further research is prompted to determine whether cellulitis is a clinical manifestation of COVID-19, especially in immunocompromised patients.

**Abstract # A24**

**Type of presentation: Poster**

**Authors:** Mildred Min[1], Jasminder Malhi[1], Aleeha Noon[1], and Jennifer Ornelas[2]
[1]College of Medicine, California Northstate University, 9700 W Taron Drive, Elk Grove, CA 5757.
[2]Dermatology, Pacific Skin Institute, 1495 River Park Dr, Suite 200, Sacramento, CA 95819

**Title:** Presentation of Pediatric Pityriasis Lichenoides Et Varioliformis Acuta Following COVID Vaccination

**Introduction:** Pityriasis lichenoides et varioliformis acuta (PLEVA) is a rare skin disorder of an unknown etiology. One suggested theory is that PLEVA is a lymphoproliferative reaction triggered by antigenic stimuli such as viruses or vaccines.[1] Clinically, PLEVA presents as a sudden onset of scaly, erythematous macules and papules localized to the trunk and proximal extremities.[2]
**Case Presentation:** Here, we report the case of a 16-year-old male who developed erythematous scaly papules on the chest, abdomen, arms, and AAthighs two weeks after receiving his second dose of the COVID-19 mRNA vaccine. Punch biopsy findings confirmed the diagnosis of PLEVA. Management of the patient's condition included therapies such as clobetasol solution, betamethasone valerate cream, and phototherapy.
**Case Discussion:** The diagnosis of PLEVA relies on the clinical picture and biopsy of an active lesion. Biopsy typically depicts focal parakeratosis, wedge-shaped lymphocytic infiltrate, and neutrophil margination and erythrocyte extravasation within dermal vessels. This case is unique because although PLEVA has been recorded as a cutaneous manifestation of COVID-19 vaccination, it has not been recorded as such in a pediatric patient.

**Abstract # A25**

**Type of presentation: Poster**

**Authors:** Satori Iwamoto[1], Leilani Hernandez[2], and Gary Chu[1]
[1]College of Medicine, California Northstate University
[2]University of California, Berkeley

**Title:** Transcend the Symptomatic Surface: Wernicke's Encephalopathy

**Introduction:** Wernicke's encephalopathy (WE) can occur in up to 2.4% of the population. WE usually presents a classic triad of ophthalmoparesis with nystagmus, gait ataxia, and confusion. Common risk factors for WE include malnutrition and substantial alcohol usage. In this report, we present a case of a young healthy male with an atypical presentation of WE.
**Case Description:** The patient is a 37-year-old, previously healthy and non-cachectic, male with an unclear chronic psychiatric disorder who was brought to the emergency department for altered mental status. He had no history of alcohol use or malabsorption, and had a BMI of 23.4 kg/m2. The CT of his head was negative for acute stroke. Moreover, the workup was significant for dehydration with ketonuria, which had a non-anion gap metabolic acidosis, hypernatremia, acute renal injury, and urinary retention. The patient was altered and unable to provide history, and his family was unreachable despite multiple attempts. Then, D5-NS was given to the patient for hydration. On day two, a neurology consultant noted that the patient had ophthalmoplegia with disconjugate, right eye abduction palsy. In addition, the patient had sustained direction-changing vertical and horizontal nystagmus. The MRI of the brain was consistent with WE. It turned out the patient intentionally lost 50 lb in the past 5 months. After administering thiamine via IV, the patient's condition improved and he was later discharged to a skilled nursing facility for acute rehabilitation.
**Case Discussion:** In the absence of the classic triad or history of malnutrition or alcoholism, WE is typically not high on the differential for a patient that presents with altered mental status in the emergency department. Giving dextrose to such a patient without prior thiamine administration may cause irreparable harm to the patient. Given thiamine's ubiquitous availability, negligible cost, and low risk of toxicity, we recommend providing thiamine empirically for any and all patients presented to the emergency department with altered mental status prior to administration of any dextrose.

**Abstract # A26**

**Type of presentation: Poster**

**Authors:** Christiane How-Volkman[1], Kanika Gulia[1], Vincent Chen[1], and ForShing Lui[1]
[1]College of Medicine, California Northstate University

**Title:** Dismantling "Neurophobia": An Analysis of the For-Profit CNUCOM's Neurology Medical Education

**Introduction:** Neurology has often been deemed the most difficult specialty by medical students worldwide. Since the 1990s, medical students have experienced a sense of "neurophobia," the fear of specializing in neurology, citing the limited exposure to clinical scenarios, lack of resources, and poor neurology teaching—forming the basis of their aversion. Between 2019 and 2022, about 1.8% of US medical students matched in neurology or child neurology residency nationally. With a recent article questioning the credibility of for-profit medical schools in providing a well-curated education to their medical students, this study aimed to examine California Northstate University's (CNU) success in producing future neurologists. CNUCOM is a new medical school in Elk Grove, CA with an integrated curriculum. Basic and clinical science disciplines are integrated into a near longitudinal curriculum through a neuroscience course with a main focus on more clinically relevant basic science contents, followed by a mandatory clinical clerkship during their third year, and an in-house neurology elective before the students go on their away rotations and residency applications in addition to other electives during their fourth year of the curriculum. In addition, students may participate in the Student Interest Group in Neurology (SIGN).
**Methods:** Statistical analysis compared three years of CNU match data to the National Resident Matching Program (NRMP) yearly reports.
**Results:** Although there was no difference between the percentage of those applying to a neurology specialty and those who matched nationally, a higher proportion of CNU seniors matched into a neurology specialty. CNU, over three nonconsecutive years, matched an average of 7.69% of MD seniors in neurology, towering the national average of 1.8%.
**Conclusion:** This difference between CNU compared to the nation, CNU's Neuroscience curriculum demonstrates a significant retention rate of students entering the field of neurology, which is attributed to its unique longitudinal structure and extracurricular opportunities.

**Abstract # A27**

**Type of presentation: Poster**

**Authors:** Muzammil Akhtar[1], Kayla Umemoto[1], and Dinesh Vyas[1,2]
[1]California Northstate University College of Medicine, Elk Grove, CA, USA
[2] Department of Surgery, Dameron Adventist Hospital, Stockton, CA, USA

**Title:** First report of a large, solitary splenic cyst caused by disseminated coccidioidomycosis in an immunocompetent patient

**Study objective(s):** Coccidioidomycosis infections are becoming more prevalent in both endemic and non-endemic regions. This case report is a unique presentation of a splenic cyst secondary to a disseminated coccidioidomycosis infection in an immunocompetent patient. Atypical presentations of disseminated coccidioidomycosis are important to document to increase awareness of this increasingly prevalent infectious disease and the unique ways it can present.
**Methods:** The patient's chart was reviewed on Cerner Electronic Medical Record, including past medical history, physical exam findings, diagnostic tests, and laboratory values. The chart was evaluated to make an accurate diagnosis of coccidioidomycosis. Despite appropriate antifungal therapy, the patient developed a disseminated infection to the spleen, resulting in the growth of a splenic cyst.
**Results:** Due to the large splenic cyst found on abdominal CT without contrast causing symptoms of pain and abdominal fullness, the patient underwent an uncomplicated robotic splenectomy. Immunohistological stains of the cystic lining cells were positive for calretinin, WT1, human bone marrow endothelium marker-1 (HBME-1) and negative for factor eight and CD31; Ki67 stained in rare cells. One day after surgery, the patient was tolerating diet and ambulating. He received the pneumococcal, meningococcal, Haemophilus influenzae, and seasonal influenza vaccines upon discharge.
**Conclusions:** Currently, the southwestern United States is commonly thought of as the endemic region for coccidioidomycosis, however recent reports show this region to be expanding beyond its known borders with cases presenting in Washington, Missouri, and Texas. This prompts the need for improvements in diagnostic testing to detect this fungus earlier in the disease course along with an increase in randomized clinical trials to strengthen the evidence behind new treatment recommendations.

**Abstract # A28**

**Type of presentation: Poster**

**Authors:** Arya Afzali[1], Collin Clarke[1], Anand Dhaliwal[1], Kevin Yu[1], and Jose Puglisi[2]
[1]California Northstate University College of Medicine Class of 2024
[2]California Northstate University College of Medicine Faculty

**Title:** 3D Printed anatomic models allowing for customization: A new approach with potential advantages over computed tomography based models and cadavers

**Introduction:** The use of cadavers in medical education is common, but the costs and limited availability associated with this practice have caused educators to look for alternatives such as 3D printed models (3DPM). A limited amount of studies have shown 3DPM to be a valuable educational tool that offers an improved experience compared to 2D images. Most of these studies have used 3DPM designed using the results of CT/MRI scans, offering extremely accurate representation of the human body. However, the use of CT/MRI scans to create 3DPM does not allow for customization of which structures are represented or clear delineation of individual anatomical structures.
**Study Objectives:** We hypothesized that creating multiple 3DPM of the human knee based on anatomically correct artistically renderings with individually designed components as opposed to CT/MRI DICOM data would offer medical students a more manageable avenue for creating 3DPM that would be suitable for introductory medical education.
**Methods:** In this study we created multiple 3DPM of the human knee using artistic renderings that were manipulated in Blender and printed via a stereolithography (SLA) 3D printer. We created three different knee models for this study (one with the femur removed, one with the tibia removed, and one with no structures removed) to expose areas of the knee joint that are often difficult to find in a cadaver.
**Results:** The study found that 3DPM based on artistic renderings can provide a viable alternative for educators seeking to create models that will be able to isolate anatomical structures of interest, as well as the ability to print models with selective levels of tissue included.
**Conclusions:** Exploration of this new approach to creating 3DPM with such advantages improves accessibility for anatomy education programs who do not have access to CT/MRI DICOM data or the usage of cadavers to teach students.

**Abstract # A29**

**Type of presentation: Poster**

**Authors:** Devan J. Abhari[1], Elise E. Hill[2], Peter A. Learn[3], John D. Horton[3], Kerry Latham[3], and Ian Valerio[4]
[1]College of Medicine, California Northstate University
[2]University of California Davis, David Grant Medical Center
[3]Uniformed Services University of Health Sciences
[4]Massachusetts General Hospital

**Title:** The Power of Cooperation: A Quantitative Analysis of the Benefit of Civilian Partnerships on the Academic Output of Military Surgeons

**Introduction:** Military-civilian partnerships are crucial to maintaining the skills of active-duty surgeons and sustaining readiness. There have been no publications that report the quantitative effect of these partnerships on academic research. To address this question, the H- indices of active-duty surgeons with a civilian affiliation were compared to those without. As a secondary outcome, H-indices of military surgeons with and without an appointment to the Uniformed Services University of the Health Sciences (USUHS) were similarly compared. We hypothesized that military surgeons with civilian affiliation would have higher H- index as compared to those without.
**Methods:** Rosters of active-duty military surgeons were obtained confidentially through each branch Consultant. H-indices were found on Scopus. Graduation dates and hospital affiliations were identified via public Doximity, LinkedIn profiles, and through hospital biographies. Rosters were cross referenced with USUHS appointments. Stata software was used for final analysis.
**Results:** Military surgeons without a civilian association have a median H-index of 2 versus 3 in those with such an affiliation ($p=0.0002$). This pattern is also seen in average number of publications, at 3 and 5 articles ($p<0.0001$). When further stratified by branch, Air Force surgeons have median H-indices of 2.5 and 1 with and without a civilian affiliation, respectively ($p=0.0007$). The Army surgeons follow a similar pattern, with median H-indices of 5 versus 3 for those with and without affiliations ($p=0.0021$). This significance does not hold in the Naval subgroup. Similar results are found for the secondary outcome of USUHS appointment, with a median H-index of 3 versus 2 in those with and without civilian affiliations ($p<0.0001$). In the multivariable Negative Binomial regression model, both civilian affiliation and USUHS appointment significantly increased H-index in the overall cohort, with IRRs of 1.32 (95% CI = 1.08, 1.61) and 1.56 (95% CI = 1.28, 1.91), respectively.
**Conclusions:** This paper provides objective evidence that there is a benefit to military-civilian partnerships on the academic output of military surgeons. These relationships should continue to be fostered and expanded.

**Abstract # A30**

**Type of presentation: Poster**

**Authors: Authors:** Bahaar Kaur Muhar[1], Shawn Cho[1], Ashwin Sidhu[1], Jason Chang[2], and Forshing Lui[3]
[1] College of Medicine, California Northstate University
[2] Kaiser Permanente South Sacramento Medical Center
[3] College of Medicine, California Northstate University

**Title:** Isolated Hypoglossal Nerve Palsy Secondary to Oligosecretory Multiple Myeloma

**Introduction:** Isolated hypoglossal nerve (CN XII) palsy is rare. Neurological complications of multiple myeloma (MM) are quite common, most often due to hyperviscosity and paraprotein-related neuropathy. Direct compression of CN XII can be caused by plasmacytoma, yet direct invasion by MM is extremely rare.
**Case Presentation:** We are reporting a very unusual case of a 45-year-old man who presented with an isolated right CN XII palsy. **C**
**Case Discussion:** The cause revealed by MRI is stenosis of the hypoglossal canal resulting from lytic bony erosion. Despite negative serum and urine protein electrophoresis tests, the final diagnosis of oligosecretory MM was confirmed by serum-free light chain test and bone marrow biopsy. The causes and diagnosis of isolated XII nerve palsy and oligosecretory MM are discussed.

**Abstract # A31**

**Type of presentation: Poster**

**Authors:** Yui Seo[1], Mark Reed[1], Jason S. Chang[2], and Forshing Lui[3]
[1]College of Medicine, California Northstate University, Elk Grove, USA
[2]Neurology, Kaiser Permanente South Sacramento Medical Center, Sacramento, USA
[3]Clinical Sciences, California Northstate University College of Medicine, Elk Grove, USA

**Title:** A Case of Wernicke's Encephalopathy Precipitated by Anorexia Nervosa Comorbid with Schizophrenia

**Introduction:** Wernicke's encephalopathy (WE) is a neuropsychiatric condition caused by thiamine deficiency often associated with alcoholism. Prolonged WE without proper treatment can lead to the chronic and irreversible condition, Wernicke-Korsakoff syndrome, characterized by a series of personality changes, learning deficits, confabulation, and/or anterograde and retrograde amnesia (or related memory deficits). Thiamine deficiency can less commonly be associated with bariatric surgery, GI disorders, hyperemesis gravidarum, cancers, systemic diseases, eating disorders, or dietary malnutrition. Despite being known for its classic triad of clinical symptoms (nystagmus/ophthalmoplegia, gait ataxia, and confusion), WE patients more commonly present with a plethora of non-specific symptoms, which can often include acute altered mental status or delirium. Obscure clinical presentations have often led to delay in the appropriate identification and diagnosis of patients with earl-onset WE – more so if they present with comorbidities.
**Case Presentation:** We are presenting an unusual case of WE because the patient has a known, 3-year history of schizophrenia without an established history of alcoholism or an eating disorder. Our patient demonstrated the classical triad of WE symptoms, but early diagnosis of his condition was complicated by his minimal alcohol use, additional presentation of dehydration, and history of functional psychosis.
**Case Discussion:** This case demonstrated the difficulties frequently encountered by clinicians in making a diagnosis of WE for patients with underlying psychiatric disorders. For a punctual diagnosis, a high index of suspicion is most important to prevent further exacerbation of neuronal death seen in WE> Thus, IV thiamine should be administered to any patient with acute encephalopathy or altered mental status given its low cost and lack of side effects. Therefore, it is recommended that physicians remain vigilant about associations between mental health disorders and schizophrenia.

**Abstract # A32**

**Type of presentation: Poster**

**Authors:** Omar Elsemary[1], Iqbal Grewal[1], Saifullah Nasim[1], and Valerie Gerriets[1]
[1]College of Medicine, California Northstate University

**Title:** Studying the Co-Presentation of FSGS and IgA Nephropathy in a Young Female with No Significant Risk Factors

**Introduction:** Focal and segmental glomerulosclerosis (FSGS) and IgA nephropathy are among the most common glomerular disorders. FSGS is characterized by focal scarring affecting less than 50% of glomeruli while IgA nephropathy is characterized by the deposition of IgA in the mesangium of glomeruli. The presence of both diseases in a single patient is uncommon, but the presence of both in a young individual with no predisposing factors is exceedingly rare. As such, our case report outlines the unusual presentation of both disorders in a young Hispanic female with no known risk factors.
**Case Presentation:** A 22-year-old Hispanic female with no known medical problems presented to the Emergency Department (ED) with a 3-day history of worsening generalized crampy abdominal pain. She has been experiencing similar, albeit less severe, pain intermittently over the past year, and has been taking ibuprofen 600 mg once a day 2 - 3 times a week since the onset of symptoms. She also reported nausea, vomiting, and diarrhea since the onset of abdominal pain. Her history was also remarkable for increased urinary frequency for the last 2 years without accompanying dysuria, urgency, or hematuria.
**Case Discussion:** FSGS and IgA nephropathies coexisting in one patient is not a common occurrence and there has been little reported in the literature explaining its pathophysiology or its treatment. The conditions co-existing means that you will experience symptoms, clinical findings, and biopsy reports that overlap with both FSGS and IgA nephropathy.

**Abstract # A33**

**Type of presentation: Poster**

**Authors:** Priya Manhas[1] and Han-Rong Weng[1]
[1]California Northstate University College of Medicine, Elk Grove, CA

**Title:** Abscisic acid as a regulator of neuroinflammation and neuropathic pain

**Introduction:** Millions of Americans suffer from chronic pain because current analgesics are either ineffective or unsafe. Development of novel analgesics with higher potency and safer features are in great demand. One of most challenging chronic pain conditions in clinics is neuropathic pain caused by injury or dysfunction in the sensory nervous system. Numerous studies over the past two decades have shown that neuroinflammation in the spinal cord plays a critical role in the genesis of neuropathic pain. Neuroinflammation is regulated by glial cells in the CNS. Accumulating data suggest that abscisic acid (ABA) can ameliorate neuropathic pain via regulating inflammation.The aim of this project is to critically review current literature on the role of ABA and its binding receptor LANCL2 in the regulation of inflammation and neuropathic pain.
**Methods:** A literature search was performed on Google Scholar and PubMed using key words: “abscisic acid”, “neuroinflammation”, and “neuropathic pain”. To understand the signaling mechanism of ABA, we included additional key words such as “LANCL2” and “PPARG”.
**Results:** The presence and action of ABA was analyzed in both plants and humans in fifty-six articles. It was demonstrated that treatment of ABA ameliorates inflammatory processes induced by many diseases, including type 2 diabetes, irritable bowel syndrome, atherosclerosis, chronic obstructive pulmonary disease, asthma, renal ischemia, and Alzheimer’s disease. Both ABA and LANCL2 are present in the spinal cord. Systemic or spinal topical application of ABA produces analgesic effects in rats with neuropathic pain. Treatment of ABA suppresses spinal glial activation and neuroinflammation induced by nerve injury. ABA produces analgesic effects and anti-inflammatory effects via activating the peroxisome proliferator activated-receptor gamma (PPARG) signaling pathway.
**Conclusion:** ABA ameliorates neuropathic pain and inflammation in different diseases. These recent findings suggest the potential usage of ABA as a novel analgesic for management of neuropathic pain.

**Abstract # A34**

**Type of presentation: Poster**

**Authors:** Allen Dang[1], Yui Seo[1], Brian Gao[1], Mark Reed[1], Akshay Jakkidi Reddy[2], Curtis Duncan[3], Melanie Yoshihara[1], and Joshua Melvin[4]
[1]California Northstate University, College of Medicine
[2]California University of Science and Medicine, School of Medicine
[3]University of Nevada, Reno School of Medicine
[4]Sutter Medical Center Sacramento

**Title:** Surgical Mindfulness: The Physiological Basis of Pain Modulation in Acute Perioperative Pain and Anxiety

**Introduction/Study objective:** The experience of pain is two-fold, comprising both physical and mental aspects. In particular for perioperative medicine, adequate pain control is one of the major limiting factors in postoperative healing and hospital discharge. Tapping into the mental component of pain perception and management, anxiety and mental catastrophization have been shown to play a significant role in not only predicting the amount of pain a postoperative patient may experience, but also their analgesic requirement. Kabat-Zinn’s 10-week guided MBSR course found that 65% of participants experienced more than a 33% reduction in chronic pain, some as high as 50%. Given the robust research supporting mindfulness meditation as a way to cope with chronic pain, we propose the application of these same techniques to the perioperative environment to help patients manage their acute postoperative pain. This abstract is intended to educate the audience on the viability of surgical mindfulness and its application in clinical practice.
**Method:** Searches were conducted on PubMed to find studies on the use of mindfulness in pain. Exact searches were done with the keywords “mindfulness in chronic pain,” “mindfulness in acute pain.” All time frames were searched.
**Results:** Current literature suggests a predictive association between anxiety, catastrophization, and the development of chronic postoperative pain.
**Conclusion**: The authors have submitted documentation for institutional review board approval and intend to investigate the link between surgical mindfulness and acute pain. Patients undergoing elective surgery with acute pain will be recruited from Sutter Health. A five-video-series will be given to patients preoperatively and postoperatively. Pain perception scores, anxiety scores, mood scores, and locus of control will be tested within each interval. If the findings of this future study is significant, it may lay groundwork for the discovery of a potentially cost-effective method of improving patient outcomes.

**Abstract # A35**

**Type of presentation: Poster**

**Authors:** Anand Dhaliwal[1], Samuel Salib[1], Meghana Renavikar[1], Mariam Khalil[1], and Vijay Khatri[1]
[1]College of Medicine, California Northstate University

**Title:** Factors Influencing NBME Neurology Shelf Exam Score: a systemic review

**Introduction:** This review aims to analyze the factors influencing NBME Neurology Subject Exam scores of third-year medical students. Numerous factors influence a student's success in their neurology clerkship. These include the sequence of clerkships, quality of preclinical education, integration of standardized patients into the curriculum, and availability of resources and support. A thorough search of the literature on factors that influence medical students' clerkship rotations was conducted to identify relevant studies which were critically reviewed and synthesized. This study was done after identifying the concurrent lack of information about and the need for medical directors to identify which factors affect their students' scores the most. Additionally, prior knowledge and experience in neurology, study habits, and use of study materials were found to impact exam scores positively. This review highlights the importance of considering these factors in designing and implementing medical education programs.
**Methods:** Three researchers independently performed study selection via Embase and PubMed. These sites were searched for relevant papers and compiled into EndNote, a citation manager software. Articles included from this systematic review focused on studies examining one or multiple factors impacting NBME subject exam performance of third-year neurology clerkships. Statistical analysis using PRISMA guidelines was specifically conducted to determine which factors significantly affected students' scores on NBME Neurology shelf exams.
**Results:** Pubmed and Embase collectively yielded 2,823 articles, of which 25 were selected for in-depth analysis.The selected papers were put into three overarching categories pertaining to the factors they emphasized: preclinical factors, third-year clerkship scheduling, and educational methods. After analyzing the papers, we expect to be able to define the statistical relationship between categorical variables and their effect on students' third-year NBME Neurological exam.
**Conclusion:** This is the first systematic review to evaluate the factors that impact NBME Neurology Shelf Exam scores. Multiple factors during Neurology rotations influence student scores on the NBME Neurology Shelf exam and can be utilized to tailor curriculum and assess the quality of education.

**Abstract # A36**

**Type of presentation: Poster**

**Authors:** Arya Afzali[1], Anand Dhaliwal[1], and Alexander J. Nedopil[2]
[1]California Northstate University, College of Medicine
[2]Orthopädische Klinik König-Ludwig-Haus, Lehrstuhl für Orthopädie der Universität, 97074 Würzburg, Germany

**Title:** Descriptive Review of Surgical Techniques and Respective Patient Reported Outcomes in Adult Developmental Dysplasia of the Hip

**Introduction:** The surgical protocols currently used for the treatment of developmental dysplasia of the hip (DDH) are varied, with sufficient differences in clinical outcomes that warrant review on the part of practicing orthopedic surgeons. Treatment options for DDH change based on a surgeon's discretion due to the broad range of procedures available, modifications to traditional techniques, and variability of deformities between dysplastic hips. Therefore, it is not feasible to compare procedures to identify a universally optimal approach to treatment. Rather, this paper looks to summarize the current novel techniques within the realm of surgical treatment for adult DDH, thus serving as a guide to surgeons looking to quickly familiarize themselves with available techniques.
**Methods:** We performed computer systematic literature searches of the Embase and Pubmed databases from 2010 to 02/04/2022. Both databases were first searched with the search terms "hip dysplasia" AND "osteotomy" in all fields. A second search was conducted with the terms "hip dysplasia" AND "arthroscopy" in all fields. A third search was conducted with the terms "hip dysplasia" AND "arthroplasty." Exclusion criteria included systematic reviews, case reports, letters to the editor, conference abstracts, non-English language studies, studies examining salvage/revision procedures, pediatric studies and studies treating hip dysplasia secondary to other diseases (cerebral palsy, Legg-Calve-Perthes, septic arthritis, etc).
**Results:** A total of 17 articles were included in the final analysis. Study parameters as well as their respective patient reported outcomes were described in detail and compiled into diagrams.
**Conclusions:** This descriptive review provides an overview of the most common surgical modalities and their respective clinical outcomes pertaining to the treatment of adult DDH. We hope that the information provided allows surgeons to investigate procedures that will assist in improving outcomes in their own patient subsets.

**Abstract # A37**

**Type of presentation: Poster**

**Authors:** Mark Reed[1], Yui Seo[1], Allen Dang[1], and Haipeng Zhang[2]
[1]College of Medicine, California Northstate Univeristy, Elk Grove, California
[2]Digital Health Implementation, Brigham and Women's Hospital, Boston, Massachusetts

**Title:** The analgesic properties of virtual reality treatment for chronic pain measured against current standards of care

**Introduction:** Given the opioid overdose epidemic and the call for physician-centric restriction of prescription analgesics, it is paramount to develop alternative treatments for chronic pain. Of note, virtual reality (VR) has been evaluated as a potent proxy or in-conjunction therapy with traditional treatment regimes. This study will cross-examine current established literature on the efficacy of VR treatment on chronic pain.
**Methods:** Our method consisted of a comprehensive search of Pubmed with the following search terms: (("virtual reality"[MeSH Terms] OR ("virtual"[All Fields] AND "reality"[All Fields]) OR "virtual reality"[All Fields]) AND ("chronic pain"[MeSH Terms] OR ("chronic"[All Fields] AND "pain"[All Fields]) OR "chronic pain"[All Fields])) AND (casereports[Filter] OR clinicaltrial[Filter] OR randomizedcontrolledtrial[Filter]). A two-tailed z-test was used to determine if the overall literature demonstrated a significant effect of VR in the treatment of chronic pain.
**Results:** Search parameters yielded 59 articles, of which 26 were excluded for irrelevance. Of the remaining 33 articles, 27 demonstrated significant decreases in pain intensity ($p<<0.05$). VR was most frequently used to treat chronic pain in the lower back (12/33) and the neck (5/33). Additionally, VR was used to alleviate chronic pain secondary to spinal cord injury, headache, dental pain, endometriosis, and post-surgical pain. VR treatments broadly constituted of two categories: distraction from painful stimuli and augmentation of the various patient-centric strategies for pain management. In the 7 articles using VR as a distraction tool, significant, short-term analgesic effects were discovered up to 12 hours post-treatment. However, there were no long-term analgesic effects. Alternatively, pain management-based methods (embodiment, VR neurofeedback, etc) demonstrated sustained analgesic effects >3-5 months post-treatment. Some patients experienced complete remission of pain.
**Conclusion:** Current literature delineates that VR significantly improves pain intensity in patients with chronic pain.

**Abstract # A59**

**Type of presentation: Poster**

**Authors:** Viacheslav Viatchenko-Karpinski[1,2], Lingwei Kong[1], and Han-Rong Weng[1, 3]
[1]Mercer University
[2]University of Minnesota
[3]California Northstate University

**Title:** Dysregulation of AMPK Leads to Enhanced Excitability in Nociceptive Sensory Neurons and Thermal Hyperalgesia in a Lupus Mouse Model

**Study Aims:** Majority of Systemic lupus erythematosus (SLE) patients live with chronic pain despite reduction in mortality associated with SLE in recent years. In this study, we aimed to determine peripheral mechanisms underlying chronic pain in SLE.
**Method:** Behavioral tests were used to assess thermal sensitivity in the animals. Whole cell patch clamp recording was used to determine membrane properties in sensory neurons in the dorsal root ganglion. Molecular protein expression was measured by western blots.
**Results:** We found that MRL/lpr mice began to show thermal hypersensitivity at the age of 10 weeks. There were no spontaneous action potentials in nociceptive sensory neurons in the DRG in either the MRL/lpr mice or control mice. Action potential firing patterns evoked by current injection in nociceptive sensory neurons in MRL/lpr mice with chronic pain were similar to those in normal control mice. Nociceptive sensory neurons from MRL/lpr mice with chronic pain had an increased excitability characterized by elevation of resting membrane potentials, lower rheobase and action potential thresholds. Input resistances in neurons from MRL/lpr and those from controls were similar whereas membrane capacitances in neurons from MRL/lpr mice were significantly smaller than those in the normal control group. These changes of electrophysiological properties in MRL/lpr mice were associated with suppression of AMP-activated protein kinase (AMPK) activity in the DRG. More importantly, subcutaneous intraplantar injection of an AMPK inhibitor (compound C) caused hypersensitivity to radiant heat on the injected hind paw in normal control mice. Compound C treatment also changed the electrophysiological properties of the nociceptive sensory neurons from the normal mice to those found in MRL/lpr mice with chronic pain.
**Conclusions:** Our study suggests that dysregulation of AMPK activity in the DRG leads to enhanced excitability in nociceptive sensory neurons and thermal hyperalgesia in mice with SLE.
This project was supported by the NIH RO1 grant (NS107569).

**Abstract # B1**

**Type of presentation: Poster**

**Authors:** Veronica Gandara[1], Lauren Hisatomi[1], Theresa Trieu[1], Kyle Taing[1], Maggie Grazela[1], and Jose Puglisi[1]
[1]Department of Medicine, California Northstate University, Sacramento, California

**Title:** The Use of HeartMath Biofeedback to Improve Heart Rate Variability and Reduce Stress Levels in Medical Students

**Introduction:** Poor heart rate variability has been recognized as a marker for increased stress levels in patients. Our study seeks to investigate the use of heart rate variability biofeedback as a novel, simple, and non-invasive intervention to allow patients to consciously regulate their HRV and consequently reduce their average stress level.
**Methods:** Students attending medical school at California Northstate University will be recruited to participate in this study. Initial contact will be made through emails and posters advertising the research project. Once recruited, each participant will meet with the CNU students involved with the project to learn how to run a session on the HeartMath device. Each participant will then perform 12 assessment and breathing exercise sessions over a two-week time period. These sessions will take place at the participant's home, during said participant's free time, with recommendation that the participant attempts to maintain a consistent environment for sessions. Data normality will be assessed prior to data comparison via the Shapiro Wilk & Levine test. If the data is normally distributed, a paired t-test will be performed to compare variables before and after the intervention. The effect size will be calculated using Cohen's d. The relationship between HRV and the anxiety level will be assessed using the Pearson r correlation coefficient. Significance will be considered at levels $p < 0.05$. All calculations will be performed using IBM's SPSS v.27 software.
**Results:** We do not have results yet, as our first cohort of participants is currently completing their trial. We are gathering data as they progress and will continue to collect data from future participants. The data we intend to analyze includes each participants' self-reported scores on a perceived stress scale before and after their trial, and numerical data on trends in each participants' coherence score each session, as measured by the HeartMath device. We intend to use this information to assess potential changes in stress levels before and after each participant's trial, as well as any changes in heart rate variability (assessed by their coherence level).
**Conclusions:** We do not have enough data gathered to arrive at a conclusion, but we look forward to reporting the results of our study.

**Abstract # B2**

**Type of presentation: Poster**

**Authors:** Michael Roche[1], and Abdelbasset Farahat[1]
[1] College of Medicine, California Northstate University

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

**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:** 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.

**Abstract # B3**

**Type of presentation: Poster**

**Authors:** Joel Rabara[1], Ishaq Aslam[1], Arshi Jha[2], Josebelo Chong[2], and Jose Puglisi[1]
[1]California Northstate University College of Medicine, Elk Grove, CA, USA
[2]Saint Joseph's Medical Center, Stockton, CA, USA

**Title:** Effects of Mask-Wearing on Pulmonary Function

**Introduction:** Wearing a mask, although perceived by some as uncomfortable enough to cause dyspnea, has not definitively been demonstrated to adversely affect lung function. The objective of this study is to obtain and compare spirometry data in subjects at rest, with and without masks to determine any changes in lung function. We hope to identify any objective correlates of dyspnea when wearing masks The null hypothesis is that there is no clinically significant (defined as a change in FEV1 or FVC of 12% and 200 mL) or statistically significant changes in spirometry data in subjects with and without masks. The alternative hypothesis is that masking provides a clinical or statistically significant change in spirometry data in subjects with and without masks.
**Methods:** We conducted a crossover study consisting of 2 stages. Demographic data were also collected via a secure, anonymous questionnaire. The first stage consisted of measuring oxygen saturations through pulse oximetry at room air as a baseline, a surgical mask, and n95 mask. Subjective work of breathing data was then gathered using a modified Borg scale. The second stage consisted of measuring pulmonary function with and without masks. FEV1 , FVC, PEF, FEF25%-75%, and FIVC were recorded. The general spirometry steps adhered to the American Thoracic Society guidelines.
**Results:** Based on the preliminary data collected from the 110 research subjects, a simple t-test shows that there is a statistically significant difference with respect to the FEV1 /FVC ratios when comparing no mask to any mask material, as well as surgical mask material to an n95 mask. The average FEV1 /FVC ratio for no mask, surgical mask, and n95 mask were 82%, 74%, and 62% respectively. We are currently in the data analysis process, accounting for the demographic data collected.
**Conclusions:** Based on preliminary data analysis, there is a significant difference in the FEV1 /FVC ratio between wearing a mask, surgical mask, and n95 mask. More analysis is needed to describe trends and associations based on demographic data.

**Abstract # B4**

**Type of presentation: Poster**

**Authors:** Emily Chou[1], Beverly Lo[1], Tiffany Tran[1], Nalin Ranasinghe[2], and Leonard Ranasinghe[1]
[1]College of Medicine, California Northstate University.
[2]AO Fox Memorial Hospital

**Title:** Acute infliximab-related infusion reaction in a Takayasu Arteritis patient

**Introduction:** Takayasu Arteritis (TAK) is a chronic autoimmune vasculitis of large and medium sized arteries, most prevalent in the aortic arch and proximal great vessels. It is a rare disease, with its incidence estimated to be 2.6 cases per million per year, predominantly affecting young asian women. The etiology of TAK is unknown, and diagnosis of TAK is difficult due to the heterogeneity and non-specificity of clinical presentation in patients. Treatment of TAK is dependent on disease progression—glucocorticoids are first line, but synthetic or biologic immunosuppressants may also be used.
**Case Presentation:** This case report pertains to a 42 year old male with a four-year history of Takayasu Arteritis who was admitted to the emergency department following a routine infusion of infliximab. Within an hour of the infusion, the patient experienced shortness of breath with upper back pain, burning chest pain, left lower quadrant (LLQ) abdominal pain, and diaphoresis—these are consistent with his typical flare symptoms, but with much more sudden onset. Upon admission to the ED, the patient received solumedrol since he was not able to complete his infliximab infusion, and no explanation for this acute infusion reaction was found. The patient was able to receive the rest of his infliximab infusion the next day without complications.
**Discussion:** This patient's sudden-onset reaction during his infliximab infusion closely aligns with the presentation of an acute non-immune-mediated infusion reaction. However, the presence of an infusion reaction in this patient is unusual as he had been receiving regular infliximab treatments for several years in addition to multiple concomitant immunosuppressive therapies.

**Abstract # B5**

**Type of presentation: Poster**

**Authors:** Lilian Kim[1], Seung-hee Cho[2], John C. Yoon[2], and Chang-il Hwang[3]
[1]College of Medicine, California Northstate University
[2]School of Medicine, University of California, Davis
[3]College of Biological Sciences, University of California, Davis

**Title:** Role of Letmd1 in Cancer Cachexia in Pancreatic Adenocarcinoma Mouse Models

**Introduction:** Cancer cachexia is a wasting disorder that causes an insidious, involuntary weight loss of more than 10% of body weight. Of the 85% of pancreatic ductal adenocarcinoma (PDA) patients with signs of major weight loss, about 30% will die from cachexia with a survival rate that decreases with more wasting. It has been suggested that cachexia is mediated by upregulation of brown-adipose tissue (BAT) activity, and Dr. Yoon's lab has recently demonstrated that Letmd1 is required for BAT thermogenesis. Understanding the role of Letmd1 can guide therapeutics that target energy balance disorders and improve the quality of life of cancer patients. We hypothesize that Letmd1 knockout mice with a pancreatic cancer transplant will show less percent weight loss than wild-type mice with a pancreatic cancer transplant.
**Methods:** Mouse pancreatic cancer cells were injected into the pancreas of WT B6 and Letmd1 KO mice via orthotopic transplantation. Once a pancreatic mass was palpable on physical examination of the mice, each mouse was weighed weekly. The percent change in body weight for each mouse will be calculated, and the data will be averaged weekly and analyzed using two-tailed Student's t-tests to compare two independent groups with a statistical significance at $p \leq 0.05$.
**Results:** Five Letmd1 KO mice and 7 B6 mice were used in this cohort. The starting average weights of the Letmd1 KO and B6 mice were 25 grams and 23.1 grams respectively. By week 7, four of the mice (2 Letmd1 KO and 2 B6) were found dead and their weights were not measured. The average weights for the KO and B6 mice the week prior were 30 grams and 28 grams respectively, and the weights of those remaining on week 7 were 29 grams and 27 grams. The average weekly percent weight loss between the two groups had a p value of 0.50.
**Conclusion:** This pilot study established that it is possible to elicit a cachectic phenotype using the orthotopic transplantation model. However, the mice died quickly within a week once the weight loss set in, leaving a very narrow time window to study potential interactions with brown adipose tissue. No significant differences between the two groups were observed, but because of the small number of mice used in the pilot study and the early deaths, it is not possible to reach a definitive conclusion about the effect of Letmd1 deletion on weight loss progression.

**Abstract # B6**

**Type of presentation: Poster**

**Authors:** Camille Ng[1], Cobi Diaz[1], Kyle Taing[1], Ishaq Aslam[1], and Jose Puglisi[1]
[1]California Northstate University College of Medicine, Elk Grove, CA, USA

**Title:** MJLab: An Interactive Simulation Program for Teaching the Physiology and Pathologies of the Neuromuscular Junction

**Introduction:** Traditional teaching methods have been placed under strain in recent years with the advent of new technologies and the ongoing COVID-19 pandemic. This has forced a migration towards virtual education, putting a greater emphasis on self-learning. Students are currently presented with two main options: the conventional lectures or the online videos on the topic. The former has the advantage of interaction between the students and the lecturer, whereas the latter has the advantage of presenting the subject in a dynamic style.
**Methods:** We have created NMJLab, a didactical tool that combines both the interactive features of the traditional lecture with the ability of presenting the subject in a dynamical format, as well as a self-assessment component for the student to verify their mastery on the topic. Utilizing PowerPoint, we have successfully been able to model the physiological cycle of muscle excitation and relaxation at the neuromuscular junction, along with four additional pathologies: myasthenia gravis, Lambert-Eaton myasthenic syndrome, tetanus, and botulism. We implemented the software into the LabVIEW language version 2021 from National Instruments for both Mac and PC devices. In modeling both the normal neuro junctional mechanism as well as the disorders, we highlighted the various phenomena that occur in each pathology through visual cues such as arrows, symbols, and graphs. Once the student has interacted with the simulation, they are presented with an assessment to gauge their understanding of the topic. At every stage, a Help option guides the student through the process.
**Results:** We created an interactive, visual simulation model to engage students in learning about various neuromuscular junction pathologies. In order to test the effectiveness of NMJLab as a learning tool, we will show the program to students at California Northstate University College of Medicine in conjunction with the medical school curriculum. After interacting with the simulation, students will fill out a survey in which they may honestly evaluate the simulation.
**Conclusions:** Computer simulations enhance student understanding and comprehension of the topics represented in the simulation and allow students to engage in self-paced learning.

**Abstract # B7**

**Type of presentation: Poster**

**Authors:** Agnieszka Witanis[1], Tibebe Woldemariam R.[2], and Sylvia Vetrone[3]
[1]College of Medicine, California Northstate University
[2]College of Pharmacy, California Northstate University
[3]Department of Biology, Whittier College

**Title:** Cytotoxic Effects of Ajoene and their Mechanism on Adherent and Non-adherent Cancer Cell Lines

**Introduction:** Garlic has a long history of human use, both as a food and as a medicine. When garlic is processed, allicin molecules are released and a chemical reaction occurs forming ajoene, an organosulfur compound. Previous studies have shown ajoene to have anti-cancerous properties such as inhibiting cell proliferation, inducing apoptosis, and reducing adhesion in solid tumor cancer cells. Subsequently, we hypothesize that treating non-adherent (leukemia and myeloma: Jurkat, RPMI 8226, and CML) and adherent (prostate and breast: LNCaP and MCF7) cancer cell lines with ajoene will result in lowered viability due to apoptosis induced by the compound. Effects of allicin, the precursor molecule, were also examined.
**Methods:** Above mentioned cell lines were cultured and exposed to variable concentrations (15–240 μM) of ajoene or allicin. Colorimetric, fluorescence, and luminescence well-plate assays (CellTiter96, MTT, Apoptox-Glo, Realtime-Glo Annexin V) were used to assess viability as well as apoptotic and necrotic cell activity. A students T-test was used to determine statistical reduction in viability of treated cells compared to a control. An IC50 calculation was also attempted.
**Results:** Cell viability was statistically reduced ($P \leq 0.05$) in a dose responsive manner at the following concentrations of ajoene: Jurkat—60 μM, RPMI 8226—20 μM, CML—80 μM, LNCaP—120 μM, and MCF7—120 μM. 48-hr biochemical monitoring of cell death showed that ajoene induced apoptosis initially, followed by secondary necrosis in all tested cell lines. Except in the CML cell line, ajoene appeared to cause higher levels of cell death than positive control cisplatin. IC50 of ajoene was calculated: Jurkat—7.033 (95% CI 1.088-18.280) and LNCaP— 62.99 (95% CI 43.23-85.41), but these values are unreliable due to a high degree of variability in trial data and subsequent poor curve-fit. Allicin did not statistically reduce viability, nor even show a general trend to that effect.
**Conclusions:** Ajoene, though not allicin, successfully reduces cancer cell viability. Higher doses are necessary to see effects in adherent vs non-adherent cancers. Viability trials for a repeat IC50 calculation are pending, as is RT-PCR to further support the cell death mechanistic findings.

**Abstract # B8**

**Type of presentation: Poster**

**Authors:** Lauren Burney[1], Shawn Cho[1], Howard Ngo[1], Louise Glaser[2], and Arpita Vyas[1]
[1]College of Medicine, California Northstate University
[2]Sutter Medical Center, Department of Hospice and Palliative Medicine

**Title:** The Importance and Challenges of Caregiver Involvement in Pediatric versus Adult Palliative Care

**Introduction:** Palliative care (PC) has proven to be beneficial for adult and pediatric cases in which their low decision-making capacity necessitates a caregiver. The primary goal is to lessen the mental, physical, and emotional burden the patient and caregiver may be experiencing.1 We analyzed two cases, one adult and one pediatric, where PC was provided to improve health outcomes for the patient and the caregiver.
**Case Presentation:** We discuss two cases, one adult and one pediatric, in which palliative intervention proved essential to management of care. Case one is a 72-year-old male with a past medical history significant for hypertension, Type II diabetes mellitus, chronic kidney disease, asthma, benign prostatic hyperplasia, and most recently, metastatic melanoma being cared for by his wife. His cognitive decline over several months caused his wife to become his sole medical decision-maker. Her attitudes toward PC and her eventual decision to compassionately withdraw care are discussed. Case two is a 12-year-old boy born at 24 weeks gestation with a grade IV intraventricular hemorrhage who developed cerebral palsy, developmental delay, Lennox Gastaut seizures, gastrostomy tube dependence, and scoliosis. He is blind, non-verbal, and non-ambulatory and has been cared for by his mother full-time since birth. He was hospitalized after a respiratory illness and pediatric palliative care subsequently joined his case. The mother enjoyed the integration of PC and continued to utilize follow-ups even after her son's discharge.
**Discussion:** The addition of PC in both cases clearly demonstrated its effectiveness, even when considering the time at which it was initiated. Comparing the two cases also highlights the similar strategies used to follow through with the patient.2 PC helped the caregivers refine their decision making to consider both presenting symptoms and future health outcomes. The extra layer of support that PC provides lessens the detrimental effects of being a sole caregiver, such as experiencing depression.3 The caregiver is integral to the medical team and cohesive care, and their input should be weighed in the decision-making process.

**Abstract # B9**

**Type of presentation: Poster**

**Authors:** Godoroja, N[1]., Waters, K[1]., Ghera, A[1]., Ranasinghe, N[2]., and Ranasinghe, L[3].
[1]Second-year medical student, California Northstate University College of Medicine, Elk Grove, California, USA
[2]Emergency physician, AO Fox Hospital, Oneonta, NY
[3]Professor and Co-Clerkship Director of Emergency Medicine, M4 Director, California Northstate University College of Medicine, Elk Grove, California, USA

**Title:** Achalasia Following a SARS-CoV-2 Infection and Recent COVID-19 Immunization in a 20-year-old Female

**Introduction:** Achalasia is an esophageal disorder characterized by loss of inhibitory neurons of the myenteric plexus in the lower esophageal sphincter (LES), presenting with dysphagia, chest pain, and regurgitation. Failure of the LES to relax and an absence of normal peristalsis, results in impaction of food and esophageal dilatation. Although the etiology of achalasia is unknown, it has been associated with viral infections and recent studies have noted concurrence of achalasia cases with COVID-19 infection, hypothesized to be caused by vagus nerve fiber damage.
**Case Description:** The case discussed in this report pertains to a 20-year-old female with a recent history of COVID-19 infection and subsequent SARS CoV-2 vaccine administration, presenting to the Emergency Department with a complaint of chest pain and shortness of breath. The patient was alert and oriented and appeared in distress. Her vital signs were within normal range and laboratory values were normal, with the exception of a low lipase enzyme of 5 U/L and an elevated D dimer of 858 ng/mL. A clinical suspicion and concern for pulmonary embolism was noted and so a computerized tomography (CT) angiography of the chest with contrast was ordered as well. Imaging revealed asymmetrically prominent left axillary lymph nodes and a dilated thin-walled esophagus with air fluid level near the gastroesophageal junction with an achalasia pattern. The history of presentation, physical examination, laboratory findings, and CT imaging were consistent with achalasia. Treatment with Motrin, intravenous fluids, and Protonix showed improvement and the patient was discharged with a follow up appointment for esophageal manometry test and pneumatic dilation treatment.
**Discussion:** With this case report, we explore the connection between COVID-19 and achalasia to help guide clinicians to potential viral etiologies of achalasia, allowing them for a prompt and efficient diagnosis and patient management.

**Abstract # B10**

**Type of presentation: Poster**

**Authors:** Natasha Arief[1], Anthony Li[1], Ellis Jang[1], Allen Dang[1], and Valerie Gerriets[2]
[1]Second-year Medical Student, California Northstate University College of Medicine, Elk Grove, CA, USA
[2]Assistant Professor of Pharmacology, Biochemistry and Immunology, Faculty Advisor, California Northstate University College of Medicine, Elk Grove, CA, USA

**Title:** Assessment of Adverse Mental Health Outcomes Among Traditional and Nontraditional Medical Students

**Introduction:** Despite institutional efforts to promote wellness amongst the student body, more than 80% of medical students continue to report some form of psychological distress. This study intends to examine whether being a non-traditional medical student (NTMS) entails higher levels of burnout, stress, depression, and anxiety than those of traditional medical students (TMS). NTMS are predicted to express higher levels of the aforementioned adverse mental health outcomes than traditional students.
**Methods:** Participants were recruited from California Northstate University College of Medicine to complete a survey with questions from the Oldenburg Burnout Inventory (OLBI), Perceived Stress Scale (PSS), Patient Health Questionnaire-9 (PHQ-9), and Generalized Anxiety Disorder-7 (GAD-7) to measure burnout, stress, depression, and anxiety, respectively. Participants were categorized as a NTMS if they indicated at least one of the following: a) 26-33 years old as an MS1, b) 26-29 years old as an MS2, c) married, d) living with a spouse, or e) living with a minor. Participants that met none of the above criteria were categorized as a TMS. Responses were analyzed using Pearson's chi-squared test.
**Results:** With 95 unique responses from TMS and 52 unique responses from NTMS, there was no statistically significant difference between TMS and NTMS for scores in the OLBI, PSS, PHQ-9, and GAD-7. We observed a chi-squared value of 1.146 for burnout, 0.610 for stress, 0.749 for depression, and 0.621 for anxiety. 56% of TMS and 56% of NTMS scored at least 35 on the OLBI. 66% of TMS and 71% of NTMS scored at least 14 on the PSS. 16% of TMS and 13% of NTMS scored at least 10 on the PHQ-9. 9% of TMS and 17% of NTMS scored at least 10 on the GAD-7.
**Conclusions:** Although we did not observe a statistically significant difference in the levels of adverse mental health outcomes between TMS and NTMS, the overall percentages of each population is strikingly high and has important implications for addressing the culture of mental health amongst medical students.

**Abstract # B11**

**Type of presentation: Poster**

**Authors:** Ishaq Aslam[1], Jashandeep Bajaj[1], Kartik Goswami[1], Mengyao Liu[1], Edward Qiao[1], Derick Quach[1], and Albin Leong[1]
[1]College of Medicine, California Northstate University

**Title:** The Threat of Climate Change on Respiratory Health

**Introduction:** Climate change is slated to have detrimental impacts on the environmental health of the planet, which can have both direct and indirect consequences on human health. Elevated global temperatures that cause more frequent heat waves lead to increased ozone concentrations due to the increase in PM2.5 levels, exacerbating air pollution levels and the frequency of asthma and COPD-related conditions.
**Methods:** The following topics were researched and discussed: air pollution and pulmonary health outcomes, global warming, indirect and direct effects on human health, green energy technologies, and current and projected air pollution data. The major findings and outcomes of these articles were summarized and contextualized in the broader scope of a literature review related to the effects of climate change on respiratory health.
**Conclusion:** Extreme weather events and changing precipitation and flooding patterns have increased the frequency of communicable infectious respiratory diseases following said incidences. While such effects are direct and immediate, more long-term effects have also been predicted, as an increase in the frequency of droughts, coastal erosion, and desertification is projected to displace up to 250 million “environmental refugees” within the next few decades. The agricultural output will be stressed by increasing crop irrigation requirements, decreasing water supplies, altering temperatures for ideal crop growth, reducing the overall nutritional intake of food due to limited supply and increasing risk of the transmission of communicable diseases due to forced displacement. While renewable energies have been touted as an alternative source to reduce human-induced climate change patterns, technologies such as lithium and solar use materials and produce by-products possessing potential detrimental effects on respiratory health.

**Abstract # B12**

**Type of presentation: Poster**

**Authors:** Ifrah Ahmed[1], Sania Elahi Mirza[1], Amreen Karim[1], Maria Sandhu[1], and Sarah Preiss-Farzanegan[1]
[1]College of Medicine, California Northstate University

**Title:** Gender-Related Barriers to Pursuing Medicine as a Career Among Medical Students

**Introduction:** Although the number of women medical students, residents, and faculty is increasing, challenges associated with gender in academic medicine have not been overcome. We explored themes that influence an individual's desire and success in pursuing medicine. We hypothesized that female medical students would have higher scores on the survey, indicating that they face gender-related barriers to pursuing medicine to a greater extent than male medical students.
**Methods:** We conducted a survey of full-time medical students in the United States investigating matters in attaining a medical education, such as gender-bias and the work-life balance. We will conduct a t-test to compare the answers from females to the answers of males, observing if there is a statistically significant difference. We will make a bar graph for each question to compare the distribution of answers and see if there is a wide variation in averages.
**Results:** Our preliminary analysis of 100 (73 females, 25 male, 2 non-binary) survey responses shows that there may be a statistically significant difference between males and females when it comes to barriers to pursuing medicine. 34.2% of females responding strongly agreed that family planning influenced their decision to go into medicine while only 8.0% of males strongly agreed with the same sentiment. We are planning on analyzing the data of other factors in our survey in the near future.
**Conclusions:** An encountered limitation was the distribution of medical schools the responses were received from. This limitation may have skewed the results because the majority of the replies came from students of one school who received the same medical education in the same environment. We are planning on conducting further analysis into other factors of our survey and cannot come to a conclusion regarding the results of our study at this time. We hope to have our analysis and results completed by CNU Research Day on 3/03/2023.

**Abstract # B13**

**Type of presentation: Poster**

**Authors:** Kristie H Lau[1], Alexandra M Tan[1], and Yihui Shi[1]
[1]Department of Basic Sciences, College of Medicine, California Northstate University, Elk Grove, CA 95757, USA

**Title:** New and Emerging Targeted Therapies for Advanced Breast Cancer

**Introduction:** In the United States, breast cancer is among the most frequently diagnosed cancers in women. Breast cancer is classified into four major subtypes: human epidermal growth factor receptor 2 (HER2), Luminal-A, Luminal-B, and Basal-like or triple-negative, based on histopathological criteria including the expression of hormone receptors (estrogen receptor and/or progesterone receptor) and/or HER2. Primary breast cancer treatments can include surgery, radiation therapy, systemic chemotherapy, endocrine therapy, and/or targeted therapy. Endocrine therapy has been shown to be effective in hormone receptor-positive breast cancers and is a common choice for adjuvant therapy. However, due to the aggressive nature of triple-negative breast cancer, targeted therapy is becoming a noteworthy area of research in the search for non-endocrine-targets in breast cancer. In addition to HER2-targeted therapy, other emerging therapies include immunotherapy and targeted therapy against critical checkpoints and/or pathways in cell growth. This review summarizes novel targeted breast cancer treatments and explores the possible implications of combination therapy.
**Methods:** Our method consisted of comprehensive review of 79 peer-reviewed publications on PubMed, ScienceDirect, and SpringerLink with search terms: “breast cancer”; “breast cancer treatment”; “HER2”; “estrogen receptor”; “progesterone receptor”; “targeted therapy”; “emerging therapies”; “triple-negative”; “antibody-drug conjugates”; “immunotherapy”; “immuno-oncolytic therapy”; “tyrosine kinase inhibitors”; “monoclonal antibodies”.
**Conclusion:** Recently, there has been much progress in treatment discovery for all subtypes of breast cancer, spanning a diversity of mechanisms from signaling blockades to immune system mobilization through vaccination. The expansion of targeted and immune therapies for breast cancer has greatly increased treatment options, especially for late-stage advanced breast cancers. With many new breast cancer drug approvals surfacing in just the last few years, it is clear there is still much to look forward to for the future of breast cancer treatment. The targeted therapies we discussed have changed the outlook of breast cancer treatment, and created hope for breast cancer patients who are still struggling to find a cure.

**Abstract # B14**

**Type of presentation: Poster**

**Authors:** Aidan Healy[1], Upraj Singh[1], Sahibjot S. Bhatia[1], Neuzil Lai[2], and Forshing Lui[1]
[1]College of Medicine, California Northstate University
[2]Kaiser Permanente South Sacramento Medical Center

**Title:** Increased Intracranial Pressure Due to Transverse Sinus Compression by a Meningioma En Plaque

**Introduction:** Idiopathic intracranial hypertension (IIH), which in the past was called pseudotumor cerebri, is defined as increased intracranial pressure (ICP) of unknown cause. Looking for underlying causes needs to be undertaken before the diagnosis is confirmed and managed accordingly. A rare cause of increased intracranial pressure is venous hypertension which can be due to a mass effect secondary to a brain mass such as a meningioma. Only a few such cases have been reported. We are reporting a rarer case of increased ICP due to external compression of the venous sinus by a rare type of meningioma, meningioma en plaque (MEP).
**Case Presentation:** The patient is a 42-year-old female with a known history of long-standing migraine without aura. She first presented to her primary care physician with a four-month history of a new kind of headache that was different from her previous migraines. Her new headache is mainly positional and occurred and worsened when lying down, coughing, sneezing, and exertion. She also complained of pulsatile tinnitus and intermittent blurring of vision with straining. The clinical diagnosis of idiopathic intracranial hypertension (IIH), aka pseudotumor cerebri, was made. Magnetic resonance imaging (MRI) of the head revealed left transverse sinus thrombosis. She was started on dabigatran; the neurologist recommended continuing this treatment with a follow-up MRI in 3 months. Follow-up MRI showed an en plaque meningioma (MEP) with hyperostotic growths compressing a long segment of the transverse sinus. With this new finding, it was evident that she was misdiagnosed with IIH, and was actually experiencing intracranial hypertension secondary to left transverse sinus occlusion due to external compression.
**Discussion:** MEP refers to a meningioma that grows in a sheet-like manner, often involving overlying dura and bones with hyperostosis. These meningiomas constitute only 2% to 9% of all meningiomas, making them quite rare. This patient’s MEP was atypical in its location causing a symptomatic case of intracranial hypertension. Knowledge of the atypical manifestation may lead to a broader and more complete differential diagnosis when assessing subtle MEP or for clinical presentations of IIH.

**Abstract # B15**

**Type of presentation: Poster**

**Authors:** Victor Berkland[1]; Miaoli Bloemhard[2]; Hannah M. Bernstein[2]; Shamili Allam[2]; Rahul Iyer[2]; Romir Rajiv Maheshwary[2]; Carly Robinson[2]; and Uma N. Srivatsa[2]
[1] College of Medicine, California Northstate University
[2] University of California, Davis Medical Center

**Title:** Posterior Wall Isolation Ablation and Atrial Arrhythmia Recurrence

**Introduction:** The posterior wall and pulmonary veins have similar embryological origins and therefore ablation of the posterior wall (PWA) in addition to pulmonary vein isolation (PVI) has been theorized to improve outcomes in atrial fibrillation (AF) ablation. We seek to assess the impact of PWA for recurrent atrial arrhythmias.
**Methods:** Patients with AF who underwent posterior wall ablation were compared to a control group of patients who underwent standard PVI ablation. Baseline demographics, comorbidities and outcome data were collected. CT heart data was included for patients who underwent posterior wall ablation. Posterior wall area was obtained, and percent posterior wall ablated was calculated using the Carto map.
**Results:** A total of 171 subjects were included. Of those, 108 (63.2%) underwent posterior wall cryoablation in addition to PVI ablation. Of the subjects enrolled, 63 control patients underwent PVI ablation alone; 49 (28.7%) underwent radiofrequency PVI and 14 (8.2%) underwent PVI cryoablation. Baseline demographics are shown in table 1. Outcome data was recorded for all patients for at least 1 year. Patients were noted to have arrhythmia recurrence if atrial arrhythmia persisted past a blanking period of 3 months. Univariate analysis showed that posterior wall ablation had significantly less atrial arrhythmia recurrence: 23.1% in PWI group, compared to 41.3% in the control group (OR = .43, p = .013). When controlling for baseline characteristics (age and sex) and comorbidities (hypertension, diabetes, CAD, OSA, HF), the difference in atrial arrhythmia remained significant. For patients who underwent PW ablation, the mean posterior wall area and percent posterior wall ablated were not predictors of atrial arrhythmia recurrence.
**Conclusion:** Posterior wall ablation is a negative predictor of atrial arrhythmia recurrences.

**Abstract # B16**

**Type of presentation: Poster**

**Authors:** Elijah Huang[1], Siddharth Kurkure[1], Yui Seo[1], Kristie Lau[1], and Jose Puglisi[1]
[1] College of Medicine, California Northstate University

**Title:** The Effectiveness of Vaccination on the COVID-19 Epidemic in California

**Introduction:** The COVID-19 pandemic is a public health crisis that has caused overwhelming morbidity, mortality, and hospitalization worldwide, with a heavier impact on areas with larger populations. California has experienced a large burden of cases, hospitalizations, and deaths. Vaccination efforts have been one of the most important measures in curtailing the adverse outcomes of the COVID-19 epidemic.
**Methods:** To quantify the effectiveness of COVID-19 vaccinations in California, we conducted a retrospective cohort study investigating how vaccination has impacted the extent of COVID-19 contraction, hospitalizations, and death totals in the state. We also compared outcomes across different time periods (I: Delta Wave, II: Omicron Wave, III: Pre-Delta Period).
**Results:** Vaccinated individuals have far lower incidence risk (IRR) of and odds of a) contracting a COVID-19 case (Delta IRR: 0.197 [95% CI 0.196, 0.198]), b) being hospitalized from COVID-19 (Delta IRR: 0.105 [95% CI 0.102, 0.108]), and c) dying from COVID-19 compared to an individual who was not vaccinated (Delta IRR: 0.0941 [95% CI 0.0879, 0.101]). The preventive fraction of the unexposed (PFU) and population preventive fractions (PPF) for cases, deaths, and hospitalizations showed significant proportions as well, with the highest percentages belonging to deaths (Delta PFU: 90.6% [95%CI 89.9%, 91.2%], Delta PPF: 77.5% [95%CI 76.2%, 78.8%]). All tests showed $p<0.001$.
**Conclusion:** This study exposes the massive impact of vaccinations in California in reducing COVID-19 cases, deaths, and hospitalizations, and the potential for far fewer adverse outcomes had there been greater vaccination compliance. Earlier and increased vaccination availability and acceptance would have decreased the contraction, transmission, hospitalization, and overall mortality of COVID-19 within communities. These results demonstrate the need to increase vaccination efforts around the world.

**Abstract # B17**

**Type of presentation: Poster**

**Authors:** Justin Yu[1], Emilie Decavel-Bueff[1], Harikumara Kathi[1], Siddharth Kurkure[1], and Jose Puglisi[1]
[1]College of Medicine, California Northstate University.

**Title:** An Investigation into COVID-19 and the Socioeconomic Impact in Sao Paulo, Brazil

**Introduction:** The COVID-19 pandemic has devastated countries across the globe, impacting communities with high rates of morbidity and mortality, as well as placing considerable strain on the economic, social, and financial welfare of many. The impact of COVID19 is well documented in America, therefore, we would like to examine the impact of COVID-19 in different regions of the world with varying social, economic, and political backgrounds. We wish to investigate the differences and commonalities between the pandemics, and the mortality determinants that cause greater impact on the people of São Paulo, Brazil.
**Methods:** We used the data given by Rede Nossa São Paulo (RNSP), a government program promoting sustainability in São Paulo, on the inequalities between different neighborhoods in São Paulo. This allows us to run statistical analysis on the different variables that may influence the mortality of COVID-19 using a customized software developed in Rstudio. An exploratory data analysis was performed to inspect trends between all the variables relevant to our topic (e.g. Median Income, Basic Government Health Coverage). Afterwards, we ran a correlation test among the social factors and the mortality of COVID-19 to determine the most relevant variables.
**Results:** We generated linear regressions among Median Income, Basic Government Coverage of the Area, Time Spent in Primary Clinics, Time Spent in Specialized Clinics, Number of Slums, and Proportion of Basic Education, in relation to Mortality of COVID among the different districts of São Paulo. All the variables contributed uniformly to the mortality of COVID-19.
**Conclusion:** Our analysis indicates that the COVID-19 was an overreaching pandemic, not affected by social determinants such as economic status, educational level, or district. This emphasized the need of a two-fold approach for rapid countermeasures, and longitudinal campaigns for early detection, vaccines, and education to avoid the resurgence of a pandemic.

**Abstract # B18**

**Type of presentation: Poster**

**Authors:** Hannah Neiger[1], Xinyu Pei[1], Anh Nguyen[1], Wenjia Angela Wang[1], James Zhou[1], Kristie Lau[1], Alexandra Tan[1], and Yihui Shi[1]
[1]College of Medicine, California Northstate University

**Title:** Characterization of the Functions of *ART3* in *BRCA1* Deficiency

**Introduction:** Deleterious germline mutations in *BRCA1/2* confer high risk of tumorigenesis in breast tissues, resulting in aggressive triple negative tumors. These mutations are not directly druggable and pose a significant challenge for the development of effective targeted treatments. Synthetic lethality (SL) offers a promising strategy to effectively target cancer cells. We have previously identified and confirmed a novel SL partner of *BRCA1*, *ART3*, which is relatively unknown in function and significance. Building upon our previous data, the aims of this phase of our study are to continue validating *ART3* as a SL partner of *BRCA1* and investigate its role in DNA repair.
**Methods**: We transduced an inducible shRNA against *ART3* and non-targeting sequence into HCC1937 cells which harbor a *BRCA1* germline mutation. We confirmed transduction efficiency and *ART3* knockdown (KD) using flow cytometry and RT-PCR. Colony formation assays were used to determine the effect of *ART3* KD on the cell viability of *BRCA1* deficient cells. Whole transcriptome RNAseq was performed to examine the gene expression alterations with *ART3* KD, confirmed with RT-PCR. We then measured DNA damage foci with γH2AX, Rad51 and 53BP1 biomarkers using immunofluorescent (IF) staining to assess the effect of *ART3* KD in the DNA damage and repair pathway in *BRCA1* deficient cells.
**Results**: *ART3* KD was achieved with inducible shRNA transduction. *ART3* KD significantly decreased cell viability in *BRCA1*-deficient cells. Sequencing revealed interesting gene transcription level changes, including those involved in cell cycle progression, cytoskeletal network, apoptosis, and proliferation pathways. We also found increased γH2AX foci formation in *ART3* KD *BRCA1*-deficient cells, suggesting ART3 plays a role in early DNA damage accumulation.
**Conclusions**: In this study, we were able to further characterize the relationship between DNA repair and *ART3,* in addition to producing more evidence of *ART3*'s involvement in critical cell processes. This is the first evidence of *ART3*'s implication in *BRCA1*-deficient breast cancer and is a promising novel target. Next steps include validating this relationship with *in vivo* studies. Finally, we hope to screen for small molecule inhibitors of ART3 as a novel breast cancer therapy.

**Abstract # B19**

**Type of presentation: Poster**

**Authors:** Nikhil Davuluri[1], Christopher D. Miller[1], Pierce Mitchell[1], Niyati Winn[2], and Carol Parise[2]
[1]College of Medicine, California Northstate University.
[2]Sutter Medical Center

**Title:** Implementing a Magic Therapy to Reduce Preoperative Anxiety in Pediatric Patients

**Introduction:** Previous studies have shown that an increase in pre-procedure anxiety correlates to an increase in post-operative pain, sleep disturbances, and other unwanted complications. Treatment for anxiety is crucial in pediatric patients who are undergoing an operation as it has been shown to improve outcomes post-operatively. A prior study demonstrated that a magic therapy intervention was successful in reducing anxiety in a population of pediatric inpatients. We hypothesize that a brief magic interventional program will reduce anxiety in pediatric patients undergoing general anesthesia pre-operatively, thus potentially leading to better post-operative outcomes in future studies.
**Methods:** This is a prospective, placebo controlled study in pediatric patients (5-11 years old) at Sutter Medical Center who are undergoing general anesthesia for a procedure. Two age-matched groups of patients will be created, with one receiving the magic intervention and the other receiving a sham control intervention. Both groups will be administered the Facial Image Scale(FIS) before their respective intervention and immediately after. The scores will be compared using a Wilcoxon Rank Sum Test and analyzed through ordinal regression analysis to determine whether age, sex, and previous experience with anesthesia are associated with post intervention anxiety. In addition, the performer of the magic intervention will be trained and rated on a standardized scale by an experienced magician to ensure competence.
**Results:** Early results are expected in late February. Conclusions:
**Conclusions**: cannot be drawn at this time.

**Abstract # B20**

**Type of presentation: Poster**

**Authors:** Tatiana Vázquez[1], Nazaret Núñez[2], Daniela Cruz[2], Diana Guzman[3], Christa Helms[2], and Sheba George[2]
[1]California Northstate University College of Medicine
[2]Charles R. Drew University of Science and Medicine, CHW Academy
[3]University of California, Davis School of Medicine

**Title:** Charles R. Drew University of Science and Medicine Community Health Worker Academy Curriculum Effectiveness

**Introduction:** With the rise of community health workers on health care teams in clinical settings, there has been a corresponding rise in training programs for trainees going into the workforce with a non-standardized, grassroots history. We sought to evaluate the effectiveness of a clinically focused, C3 standards -based community health worker curriculum.
**Methods:** This is a retrospective evaluation study that used data collected during the administration of the first two cohorts of the Community Health Worker Academy at Charles R. Drew University of Science and Medicine. We analyzed data collected from three sources: module knowledge checks from cohort two, pre module surveys and post module surveys from cohort one and cohort two. On module surveys, trainees self-reported their confidence and familiarity with module concepts on Likert Scale. This was converted to numerical data for quantitative analysis. Descriptive statistics was used to analyze module knowledge checks. Paired t-testing was used to analyze pre and post module delivery surveys.
**Results:** Descriptive analysis of knowledge checks for cohort two showed an overall average of 85.87% correct responses with a standard deviation of 10.42%. Paired t testing analysis of pre and post module surveys revealed a statistically significant difference for self-reported familiarity and confidence for cohorts one and two, indicating that there was a meaningful change in familiarity and confidence related to curricular content for participants after the training. For self-reported confidence of cohort one, the p-value was less than 0.0001, the t statistic was 8.7612, and the degrees of freedom was 51. For self-reported familiarity of cohort one, the p-value was less than 0.0001, the t statistic was 10.6811, and the degrees of freedom was 50. For self-reported confidence of cohort two, the p-value was less than 0.0001, the t statistic was 6.4981, and the degrees of freedom was 16. For self-reported familiarity of cohort two, the p-value was less than 0.0001, the t statistic was 8.6594, and the degrees of freedom was 16.
**Conclusion:** We conclude that the curriculum was effective in raising trainee familiarity and confidence with module topics. However, future training effectiveness studies should include data and analysis of preceptor evaluations to aid in curriculum evaluations.

**Abstract # B21**

**Type of presentation: Poster**

**Authors:** Yui Seo[1], Allen Dang[1], Bardia Ghayoumi[1], Mark Reed[1], and Valerie Gerriets[1]
[1]California Northstate University College of Medicine, Elk Grove, CA

**Title:** Investigating differences in specialty interest between medical students in their preclinical and clinical years

**Introduction:** Medical school is an arduous path that requires significant time and commitment. One of the questions most frequently asked of medical students is their future specialty considering factors such as program duration, levels of burnout, and practice lifestyle. These career interests may be swayed by exposure to real clinical practice. In this study, we analyze the progression of medical student specialty interest over pre-clinical and clinical years.
**Methods:** Participants were recruited from CNUCOM and given a survey categorizing the participant's academic year and perceived specialty(s) of interest. Participants were given a weighted score to each specialty category of choice denoted by 1/total number of specialties interested in. Participants were divided into pre-clinical years (M1 and M2) and clinical years (M3 and M4), and their weighted scores in each specialty interest were compared via unpaired t-test.
**Results:** 251 (189 preclinical and 62 clinical) medical students were surveyed on their specialty interests for future residency. There were 14 specialties in which preclinical students had more interest in, of which none had statistically significant changes following exposure to clinical years. There were eight specialties in which clinical year students had more interest in. Of the eight, two had statistically significant changes - emergency medicine ($p=0.02$) and family medicine ($p=0.003$).
**Conclusion:** Survey analysis of gauged medical student specialty interest at the California Northstate University College of Medicine indicates that family medicine and emergency medicine are significantly more popular tracks as students transition from preclinical (M1-M2) to clinical years (M3-M4). Potential explanatory factors include favorable match rates, or more exposure to these medically related specialties in the clinical years.

**Abstract # B22**

**Type of presentation: Poster**

**Authors:** Daniel Razick[1], Muzammil Akhtar[1], Anand Dhaliwal[1], and Biljinder Chima[2]
[1]College of Medicine, California Northstate University
[2]Sutter Medical Network

**Title:** A Case Report of Hydropneumothorax as a Presentation of Birt-Hogg-Dubé Syndrome

**Study Objective:** Birt-Hogg-Dubé (BHD) syndrome is a rare genetic disorder characterized by spontaneous pneumothorax, benign skin lesions, and an increased risk of developing renal cancer. Diagnosis is commonly made through genetic testing, physical examination, and imaging studies. Interestingly, only 200 families worldwide have been identified as having BHD syndrome. We present a unique case in which a combination of multiple chronic illnesses and significant family history led to a diagnosis of BHD syndrome.
**Case Presentation:** A 73-year old male patient presented to his family medicine physician for an annual wellness visit, during which analysis of the patient's past medical and family history led to suspicion of BHDS. 22 years prior, the patient was diagnosed with recurring bilateral pneumothoraces with apical blebs, requiring bilateral placement of chest tubes. The patient's family history was significant for his mother being diagnosed with lung cancer, his father with emphysema and alcoholism, and his paternal uncle with colon cancer. A full sequence analysis of the folliculin (*FLCN*) gene's entire coding region was ordered based on suspicion of BHDS, given the patient's significant history of recurrent pneumothorax and renal neoplasia.
**Case Discussion:** Compared to the classical findings in BHDS, the patient in this case had several unique findings including the first reported hydropneumothorax associated with the disease, absent fibrofolliculomas, recurrent bilateral pneumothorax, and late onset actinic keratosis. We present these unique findings of BHDS so clinicians may be aware of atypical presentations that may manifest in this rare disease, allowing for timely diagnosis and establishment of a care plan. The most severe manifestation of BHDS is typically considered to be some form of renal cancer which usually presents later in the course of BHDS. This highlights the importance of early diagnosis and appropriate management to prevent fatal metastases.

**Abstract # B23**

**Type of presentation: Poster**

**Authors:** Nathan Tsai[1], Anand Dhaliwal[1], Kevin Yu[1], Nancy Le[1], Leah Bourgan[1], and Joelle Jakobson[2]
[1] College of Medicine, California Northstate University
[2] Mercy Medical Group

**Title:** Postpartum Culture Negative Fibrinous Peritonitis in a previously healthy 20-year-old woman

**Introduction:** Peritonitis is inflammation of the peritoneum that can arise from a number of complications affecting the lining of the abdominal wall and organs. Peritonitis that presents with sepsis can have a mortality rate as high as 54.55%. Peritonitis can present with a wide variety of symptoms, but acute abdomen and associated systemic inflammatory reaction is a rare presentation in patients without significant past medical history or recent trauma.
**Methods:** We reviewed a case of peritonitis in a 20-year-old G2P1 woman who presented nine days postpartum to the emergency room with acute abdomen and associated systemic inflammatory reaction. Patient's chart review revealed that IR paracentesis was performed, yielding a milky, purulent peritoneal fluid with no visible organisms and negative cultures. Following surgical laparotomy, she recovered fully without any complications. We review the available literature regarding postpartum peritonitis, discuss management, and speculate as to its cause in this case.
**Results:** Antibiotics and paracentesis were insufficient in managing the patient's condition which continued to worsen over several days. Given her continued deterioration despite clinical intervention, she underwent exploratory laparotomy and peritoneal lavage with continued broad-spectrum antibiotics. Although the source of the peritonitis was not identified, surgical intervention successfully cleared the fibrinous exudate, and the patient made a full recovery.
**Conclusion:** Peritonitis can be managed conservatively with fluid hydration and antibiotics; however, continuation of symptoms can warrant further workup, including paracentesis or drain placement. Definitive treatment includes surgical laparotomy with peritoneal lavage to identify the source of infection and clear exudate and necrotic tissue. Although the patient's extensive workup yielded no source of infection, surgical laparotomy with peritoneal lavage was beneficial in treating the acute abdomen. We speculate as to causes of this patient's fibrinous peritonitis, such as vernix caseosa peritonitis; however, further studies of the patient's laboratory specimens are warranted for diagnosis.

**Abstract # B24**

**Type of presentation: Poster**

**Authors:** Tara Gallant[1], Monica Lieng[2], Jennifer Rizzo[2], James D. Brandt[2], and Michele C. Lim[2]
[1]California Northstate University College of Medicine
[2]Department of Ophthalmology & Vision Sciences, University of California, Davis Eye Center

**Title:** Trabeculectomy Training Using Limes and Chickens

**Introduction:** In an era when trabeculectomy surgeries in the United States are on the decline, ophthalmology residents may have limited opportunities to practice surgical techniques critical to success. We propose that the key steps of trabeculectomy surgery can be introduced in a wet lab using a simple surgical model based on food items.
**Methods:** A fresh lime and chicken parts with skin were purchased from a grocery store and utilized to practice trabeculectomy surgery. The white rind of a lime, used as a surrogate for human sclera, was incised to create a trabeculectomy flap. The flap was then sewn down with 10-0 nylon suture using an operating microscope. The skin of the chicken part was used to re-create fornix-based or limbus-based conjunctival incisions, which were then closed using 6-0 vicryl suture.
**Results:** This trabeculectomy teaching model is clean and safe. It does not require cadaver or animal eyes, and no fixatives are needed, thus minimizing the risk of contact with biohazardous material. There is no significant preparation time, and the lime and chicken possess reasonably realistic tissue properties for practicing the construction and closure of a partial-thickness scleral flap and closure of conjunctiva.
**Conclusions:** Wet lab curricula have proven valuable in preparing inexperienced cataract surgeons for the operating room, and the skills required for trabeculectomy surgery can likewise be introduced in a wet lab. Our wet lab materials are inexpensive and easy to obtain, making this a practical model for practicing glaucoma surgery in both westernized and developing countries.

**Abstract # B25**

**Type of presentation: Poster**

**Authors:** Keerthi Kurian[1], Yvonne Hao[2], Daniel Boczar[2], Hilliard T Brydges[2], Augustus Parker[2], Bachar F Chaya[2], Jorge Trilles[2], Ricardo Rodriguez Colon[2], and Eduardo D Rodriguez[2]
[1]College of Medicine, California Northstate University
[2]Hansjörg Wyss Department of Plastic Surgery, New York University Langone Health, New York, NY.

**Title:** A Systematic Review and Metanalysis of Anthropometric Facial Variations Among Cisgender Females from Multiple Ethnicities: Implications for Sensitive Approach to Feminizing Facial Gender Affirming Surgery

**Introduction:** Feminizing Facial Gender Affirming Surgery (FFGAS) is gaining popularity amongst a diverse population of patients experiencing gender incongruence. However, most studies examining facial femininity are based on Caucasians. Thus, it is unclear if ethnic differences exist in anthropometric measures relevant to FFGAS procedures. This study aims to analyze ethnic anthropometric variations in the cisgender female face to identify differences that are potentially relevant to FFGAS.
**Methods:** A systematic review and meta-analysis of the PubMed, EMBASE and Cochrane databases was performed following PRISMA guidelines on June 25, 2021. Original studies reporting facial anthropometry in cisgender women were included. Anthropometric measures of interest included mandibular and zygomatic width, facial and forehead height, and nasolabial angle. A meta-analysis was performed using a linear mixed-effects model for each anthropometric measure.
**Results:** A total of 1,246 abstracts were screened, yielding 21 articles that met inclusion criteria. Facial anthropometric data of 4,792 cis-gender females of 16 different ethnicities were analyzed. This meta-analysis demonstrated that compared to Caucasian cisgender women, Japanese, Chinese, and Korean cisgender women had a wider mandible (Japanese +20.13mm [Standard Error (SE) 4.43, $p<0.001$, p-value adjusted for multiple comparisons (p-adj) =0.002], Chinese +16.22mm [SE 4.39, p=0.002, p-adj=0.013]; and Korean +14.46mm [SE 3.97, p=0.002, p- adj=0.014]). Further, when compared to Caucasian cisgender women, Chinese cisgender women demonstrated a larger zygomatic width, African American cisgender women tended to have smaller nasolabial angles and Indian and Japanese cisgender women tended to have a smaller and larger facial height, respectively. However, following p-value adjustment for multiple comparisons, these differences were not found to be statistically significant.
**Conclusions:** We found that mandibular width tends to be greater for Japanese and Chinese cisgender women relative to Caucasian cisgender women. This data may be useful in counseling patients during preoperative evaluations ahead of mandibular reduction. No other anthropometric features were found to be significantly different among the ethnic groups studied. This suggests current approaches to FFGAS, which emphasize patient-specific needs and maintenance of a harmonious appearance, may require minimal or no adjustment to account for ethnic facial anthropometric differences.

**Abstract # B26**

**Type of presentation: Poster**

**Authors:** Lili Salinas, Francisco Figueroa, Claire B. Montgomery, Phung N. Thai, Nipavan Chiamvimonvat Sundeep Dugar, Somdutta Sen, Gino Cortopassi, and Elena N. Dedkova

**Title:** Novel monomethyl fumarate prodrug improves cardiac function and expands lifespan in mice with Friedreich's Ataxia

**Introduction:** Friedreich’s ataxia (FA) is a recessive ataxia caused by reduction of mitochondrial protein, frataxin (FXN). Cardiomyopathy is the leading cause of death in FA patients due to deficient FXN expression in the heart. Previously, we identified that bioactive fumarates are protective in FA cell models. We have developed a novel monomethyl fumarate prodrug, IMF, which has improved pharmacokinetic profile and compared its effect to fumarate prodrug dimethyl fumarate (DMF, Tecfidera).
**Aim:** To test the hypothesis that novel bioactive fumarate improves cardiac function and survival via Nrf-2 and HCA2 signaling pathways activation.
**Methods and Results:** Cardiac-specific FXN knockout (Mck-Cre FXNKO) mice were used as a model of severe cardiomyopathy, a characteristic of late-stage FA. Animals were randomly split in vehicle and fumarate-treated groups. Animals were treated by IMF or DMF at equimolar doses of monomethyl fumarate. Treatment started at 3 weeks of age and continued for 5 weeks in the cross-sectional study or until death in the survival study. Cardiac function was examined in-vivo by echocardiography. We found that FXNKO mice developed severe heart failure with 45% reduction in ejection fraction, increased left ventricular (LV) mass (+80%) and diameter (+308%), decreased stroke volume (-26%) and cardiac output (-38%, n=10) as compared to wild-type mice (n=12). DMF and IMF partially recovered cardiac deficits in FXNKO mice but only IMF extended the lifespan in these mice by 13%. Expression of genes in Nrf2 (NQO1, SOD2, glutathione S-transferase) and HCA2 (HCA2 and Sirt1) signaling pathways were decreased in FXNKO and restored by DMF and IMF to a different degree. Aconitase activity, used as a surrogate measure of frataxin's iron-sulfur biogenesis function, was decreased in FA by 49% and recovered 18% by IMF only.
**Conclusions:** Novel fumarate prodrug IMF improved cardiac function and expanded the lifespan in cardiac-specific FXNKO mouse model of FA more effectively than DMF.

**Abstract # B27**

**Type of presentation: Poster**

**Authors:** Alexis Cristiano[1], Anand Dhaliwal[1], and Vijay Khatri[1]
[1]California Northstate University College of Medicine, Elk Grove, CA

**Title:** Factors Influencing NBME Surgical Shelf Exam Scores: A Systematic Review

**Introduction:** There are multiple factors that may impact a student's success in a surgical clerkship, including preclinical curriculum and grades, previously completed clerkships, clerkship sequence and schedule, length of clerkship, and quality of education during the clerkship. Presence of such confounding variables makes it difficult for medical educators to assess the effectiveness of their preclinical and clinical curricula. This is the first systematic review to date that has analyzed the factors that influence NBME Surgery Subject Exam scores.
**Methods:** Computer systematic literature searches of the Embase and Pubmed databases were performed. The studies included were articles testing variables that influence surgery NBME subject exam performance of third-year medical students.
**Results:** The literature search yielded 2,823 articles, of which 17 were selected. The studies included were grouped into three categories: preclinical factors, third-year clerkship scheduling or structure, and clerkship educational methods. Analysis showed that quality of medical students' preclinical education plays a strong role, as USMLE Step 1 scores and second-year NBME scores are positively correlated with third year NBME scores, while shortened preclinical curricula negatively impacts third-year NBME scores. While multiple studies showed that length of the surgery clerkship had variable significance, the clerkship sequence showed a consistent correlation with third-year NBME scores. Taking the medicine clerkship prior to the surgery clerkship showed significant improvement in third-year NBME scores across multiple studies. Studies of educational models have also shown that increased student engagement through presentations, small-group case-based learning, and resident interaction resulted in increased test scores. Additionally, the student-perceived educational quality and preceptor-perceived clinical competency of the students via clerkship evaluations and OSCE are positively correlated with NBME exam scores.
**Conclusion:** This systematic review evaluated factors that influence student success for the NBME Surgery Subject Examination and can be used to enhance NBME Surgery Subject Examination grades.

**Abstract # B28**

**Type of presentation: Poster**

**Authors:** Andrew R. Gilbert[1], Phillip J. Summers[2], Jose Puglisi[1], Courtney Oxandale[2], Trinidad Alcala-Arcos[3], and Neil Flynn[1]
[1]College of Medicine, California Northstate University
[2]Transitions Buprenorphine Clinic of Sacramento
[3]School of Medicine, University of California – Irvine

**Title:** Increased Retention in Treatment with Higher Doses of Buprenorphine

**Study Objectives:** 1) Explore the relationship of high-dose buprenorphine treatment (25mg and higher) on retention in treatment, 2) provide a framework for providing buprenorphine medication assisted treatment (BMAT) for people with opioid use disorder.
**Methods:** This cross-sectional study consists of a randomly selected sample of 328 out of 1572 (20.9%) patients at a single outpatient buprenorphine clinic in Sacramento, CA, USA, enrolled between January 2010 to September 2017, and followed through April 2018. Patients were stratified into two groups according to mode buprenorphine dose during treatment: > or equal to 25mg (high-dose group) and <25mg (low-dose group). These groups were plotted on a survival curve base on duration of treatment.
**Results:** The patients in the lower-dose group (<=24mg) demonstrated a median retention in treatment of 65 days, while the patients in the higher-dose group (>=25mg) demonstrated a median retention in treatment of 380 days, which was statistically significant ($p<0.001$) (Figure 1).
**Conclusion:** We highly recommend providers have a low threshold in increasing buprenorphine dosages to as high as 32mg per day in patients in the early stages of their recovery. Our data suggest that the highest rate of patient dropout is at the beginning of treatment and that there is significantly higher treatment retention in patients on 25mg or higher of buprenorphine. Determining the correct buprenorphine dose is patient-specific and thus should incorporate the patient in the decision-making process throughout each monthly patient visit. A typical time course we recommend for patients undergoing BMAT is as follows: a rapid increase in dose early in treatment, a stabilization period where the dose remains constant, and a patient-initiated taper.

**Abstract # B29**

**Type of presentation: Poster**

**Authors:** Ashita Tanwar[1], Rehan B. Chinoy[1], and Dean V. Buonomano[1]
[1] Departments of Neurobiology and Psychology, Brain Research Institute, and Integrative Center for Learning and Memory, University of California, Los Angeles.

**Title:** A Recurrent Neural Network Model Accounts for Both Timing and Working Memory Components of an Interval Discrimination Task

**Introduction:** Interval discrimination is of fundamental importance to many forms of sensory processing, including speech and music. Standard interval discrimination tasks require comparing two intervals separated in time, and thus include both working memory (WM) and timing components. Models of interval discrimination invoke separate circuits for the timing and WM components. Here we examine if, in principle, the same recurrent neural network can implement both.
**Methods:** Using human psychophysics, we first explored the role of the WM component by varying the interstimulus delay. We next successfully trained a recurrent neural network (RNN) on the task.
**Results:** Consistent with previous psychophysics studies, discrimination was significantly worse for a 250 ms delay, compared to 750 and 1500 ms delays, suggesting that the first interval is stably stored in WM for longer delays. Our trained RNN demonstrated that the same network can implement both the timing and WM components. Many units in the RNN were tuned to specific intervals during the sensory epoch, and others encoded the first interval during the delay period. Overall, the encoding strategy was consistent with the notion of mixed selectivity. Units generally encoded more interval information during the sensory epoch than in the delay period, reflecting categorical encoding of short versus long in WM, rather than encoding of the specific interval.
**Conclusions:** Our results demonstrate that, in contrast to standard models of interval discrimination that invoke a separate memory module, the same network can, in principle, solve the timing, WM, and comparison components of an interval discrimination task.

**Abstract # B30**

**Type of presentation: Poster**

**Authors:** Anand Dhaliwal[1], Tomas Zamora[2], Alexander J. Nedopil[3], Stephen M. Howell[4], and Maury L. Hull[4,5,6]
[1]College of Medicine, California Northstate University, Elk Grove, CA 95757, USA
[2] Orthopedic Surgery Department, Pontificia Universidad Catolica de Chile, Santiago 8331150, Chile
[3]Orthopädische Klinik König-Ludwig-Haus, Lehrstuhl für Orthopädie der Universität Würzburg, 97074 Würzburg, Germany
[4] Department of Biomedical Engineering, University of California, Davis, CA 95616, USA
[5] Department of Mechanical Engineering, University of California, Davis, CA 95616, USA
[6] Department of Orthopedic Surgery, University of California Davis Medical Center, Sacramento, CA 95817, USA

**Title:** Six Commonly Used Postoperative Radiographic Alignment Parameters Do Not Predict Clinical Outcome Scores after Unrestricted Caliper-Verified Kinematically Aligned TKA

**Study Objectives:** Unrestricted caliper-verified kinematically aligned (KA) TKA restores patient's prearthritic coronal and sagittal alignments, which have a wide range containing outliers that concern the surgeon practicing mechanical alignment (MA). Therefore, knowing which radiographic parameters are associated with dissatisfaction could help a surgeon decide whether to rely on them as criteria for revising an unhappy patient with a primary KA TKA using MA principles. Hence, we determined whether the femoral mechanical angle (FMA), hip–knee–ankle angle (HKAA), tibial mechanical angle (TMA), tibial slope angle (TSA), and the indicators of patellofemoral tracking, including patella tilt angle (PTA) and the lateral undercoverage of the trochlear resection (LUCTR), are associated with clinical outcome scores.
**Methods:** Forty-three patients with a CT scan and skyline radiograph after a KA TKA with PCL retention and medial stabilized design were analyzed. Linear regression determined the strength of the association between the FMA, HKA angle, PTS, PTA, and LUCTR and the forgotten joint score (FJS), Oxford knee score (OKS), and KOOS Jr score obtained at a mean of 23 months.
**Results:** There was no correlation between the FMA (range 2° varus to −10° valgus), HKAA (range 10° varus to −9° valgus), TMA (range 10° varus to −0° valgus), TSA (range 14° posterior to −4° anterior), PTA (range, −10° medial to 14° lateral), and the LUCTR resection (range 2 to 9 mm) and the FJS (median 83), the OKS (median 44), and the KOOS Jr (median 85) ($r = 0.000$ to $0.079$).
**Conclusions:** Surgeons should be cautious about using postoperative FMA, HKAA, TMA, TSA, PTA, and LUCTR values within the present study's reported ranges to explain success and dissatisfaction after KA TKA.

**Abstract # B31**

**Type of presentation: Poster**

**Authors:** Alla S Ahmad[1], Anand S Dhaliwal[1], and Vijay P. Khatri[1]
[1]California Northstate University College of Medicine, Elk Grove, CA

**Title:** Factors Influencing NBME Shelf Exam Scores in Primary Care Specialties (Internal Medicine, Family Medicine and Pediatrics): A Systematic Review.

**Introduction:** Factors that influence student performance on shelf exams in primary care specialties can include quality and knowledge acquisition of preclinical curriculum, clerkship sequence, quality of education during the clerkship, and clinical experience characteristics. This systematic review investigated medical education and curricular variables that may influences NBME Subject Examination scores for family medicine, internal medicine, and pediatrics.
**Methods:** Of the 2,823 articles searched using Embase and Pubmed databases, 7 were selected for family medicine, 17 were selected for internal medicine, and 15 were selected for pediatrics. These articles were testing variables that influence NBME Subject Examination performance of third year medical students. These studies were further subcategorized into preclinical factors, third-year clerkship structure or schedule, clerkship pedagogy, and clinical experience.
**Results:** Preclinical factors such as higher USMLE Step 1 scores and early exposure to outpatient clinics were both shown to correlate with improved shelf scores in pediatrics, whereas only higher Step 1 scores correlated with improved internal medicine shelf scores. Clerkship timing with an increase in number of clerkships completed prior to the clerkship in question improved NBME shelf examinations scores for family medicine, internal medicine, and pediatrics. Advancements in didactic methods such as implementation of various computer-based education had mixed results for all three clerkships. The setting of a clinical rotation was not shown to significantly impact shelf scores in all three primary care specialties.
**Conclusion:** This systematic review analyzed factors that may affect student performance on the NBME Subject Examinations for family medicine, internal medicine, and pediatrics. Each specialty had independent factors that influenced shelf scores, however the variable that improved subject examination scores for all three primary care specialties was clerkship sequence in third-year schedules. Findings of this review can be integrated into curriculum strategies to enhance academic outcomes for NBME subject examinations in primary care specialties.

**Abstract # B32**

**Type of presentation: Poster**

**Authors:** Anuj Budhiraja[1], Vaniya Qureshi[2], and John Cusick[1]
[1]California Northstate University, College of Medicine, Elk Grove, CA 95757
[2]California Northstate University, College of Health Sciences, Elk Grove, CA 95757

**Title:** Maxillary and Mandibular Ewing Sarcoma: Diagnosis, Treatment and Future Challenges

**Introduction:** Ewing's Sarcoma (ES) is the second most common pediatric malignant bone tumor. ES of the maxilla and mandible presents with unique diagnostic, treatment, and outcome challenges. This systematic review seeks to analyze the available literature to assess predictors of metastasis and outcomes, and provide clinical recommendations for diagnosis and treatment.
**Methods:** A systematic search was conducted with restrictions referring to time (1960-2022), language (English), and study type (clinical trial, case series, case study, and datasets). The retrieved studies were screened in three stages according to predetermined criteria. Analysis of symptomatology, disease timeline, treatment, and follow-up outcomes was subsequently conducted.
**Results:** Data from 110 patients was derived from 78 articles. Swelling and pain were reported together in 30.33% of cases. The 3 most common treatment strategies were Surgery/Chemotherapy/Radiation (37.50%), Surgery/Chemotherapy (25.00%), and Chemotherapy/Radiation (11.45%). The event-free survival rate was 69.05%. 22.62% of patients developed post-treatment metastasis, among which 19.05% died of the disease with metastasis present. Metastasis to the pulmonary organs was most common and observed in 68.42% of all patients with post-treatment metastasis at follow-up. The results suggest that both the estimates of developing metastasis and death decrease significantly with age. Symptom-onset does not statistically predict metastasis or patient survival. The risk of metastasis decreases over follow-up time (>7 years). Patient survival also decreases over follow-up time (>3 years) post-treatment. There is enough statistical evidence to suggest that different treatments impact the incidence of metastasis and survival outcomes, with the best treatment in both categories being multimodality Surgery/Chemotherapy.
**Conclusions:** Maxillary and mandibular ES has a good prognosis when diagnosed early, treated appropriately, and effectively monitored. The results of this review provides clinicians with information that may guide their clinical judgment in improving outcomes for their patients.

**Abstract # B33**

**Type of presentation: Poster**

**Authors:** Alisha Mehta[1], Anuj Budhiraja[1], Sara Dahle[2], and Moyassar Abdulhameed[2]
[1]California Northstate University, College of Medicine
[2]Department of Dermatology, University of California, Davis

**Title:** Vagus Nerve Stimulation: Review and Rationale for Chronic Wounds

**Introduction:** Vagus nerve stimulation (VNS) has shown promising results in the treatment of various treatment-resistant autoimmune, neurological, and cardiovascular conditions. This systematic review analyzes the available literature on the inflammatory-mediating effects of VNS, to explore its potential use in the treatment of chronic venous leg ulcers.
**Methods:** Systematic database searching was conducted to collect articles reporting on VNS therapy in humans; only clinical trials, case-series, and review articles were included. The collected studies were screened in three stages according to predetermined inclusion criteria. Information for VNS parameters, conditions treated, serum inflammatory markers, and disease progression were reviewed.
**Results:** Among the different conditions reviewed, significant reductions in the pro-inflammatory cytokines IL-8, IL-1β, TNF-α, IL-6, IL-12, and IL-23, as well as a reduction in other pro-inflammatory markers such as, HMGB1, Substance P, NFKβ activity, MIP-1α, calprotectin, CRP, and MCP-1. Reductions in inflammation namely improved symptoms in patients with epilepsy, migraines, post-operative atrial fibrillation, and Crohn's disease. Patient perception of their chronic condition was also improved in patients with systemic lupus erythematosus and chronic pancreatitis.
**Conclusion:** The pathology of impaired wound healing involves chronic inflammation, and it has been previously reported that reducing inflammatory processes may accelerate wound repair and improve the final scar appearance. The evidence supporting the anti-inflammatory effects of VNS, as presented in this review, develop the understanding of its potential application in the treatment of chronic venous leg ulcers.

**Abstract # B34**

**Type of presentation: Poster**

**Authors:** Hailey Begert-Hellings[1], Darcy C Engelhart[1], and Ruth Haskins[1]
[1]California Northstate University, College of Medicine

**Title:** Resection of a Lipoleiomyoma of the Cervical Uterine Junction

**Background:** Lipoleiomyomas are rare, benign uterine tumors composed of smooth muscle, mature adipocytes, and fibrous tissue. These masses ordinarily arise from the uterine corpus, however there are cases with cervical origin or association. We report a case of uterine lipoleiomyoma with complete cervical encompassment requiring open myomectomy, hysterectomy, and vaginal cuff closure for excision and treatment.
**Case Presentation:** A 44-year-old premenopausal woman was referred to the gynecologist due to 3 weeks of intermittent, heavy vaginal bleeding, with episodes lasting minutes to hours and occurring multiple times per day. She additionally presented with fatigue, shortness of breath on exertion, and palpitations. Bimanual exam demonstrated an enlarged and irregularly contoured uterus. Transabdominal and transvaginal pelvic ultrasounds demonstrated a 17.3 x 11.1 x 13.3cm heterogeneous mass, thought to be an enlarged fibroid. The mass was surgically excised via exploratory laparotomy with open hysterectomy and incidental cystotomy repair. Successful surgical excision and reconstruction required multidisciplinary teamwork between gynecologists, urologists, anesthesiologists, and surgeons. Pathology revealed predominantly bland spindle cells, with scattered areas of benign mature adipose tissue, and no tumor cell type necrosis identified, consistent with a lipoleiomyoma. The mass measured 19.8cm at its longest point and weighed 874 grams. It encompassed the lower segment of the uterus and entire cervix, indicating a rare uterine-cervical lipoleiomyoma. The patient made an excellent recovery and regained all bowel and bladder function.
**Conclusions:** Uterine lipoleiomyomas are benign tumors that should be considered in the differential diagnosis for patients with large pelvic masses. Origination of the tumor is multifactorial, with cervical involvement seen in rare cases. Diagnosis is often difficult without direct biopsy and while conservative management of these benign tumors is often safe, tumor size and symptom management often necessitate surgical intervention.

**Abstract # B35**

**Type of presentation: Poster**

**Authors:** Himanshu Wagh, and Maury Hull[2]
[1]California Northstate Univeristy, College of Medicine
[2]Depatment of Orthopedic Surgery, University of California, Davis

**Title:** Step-up should be used instead of deep knee bend to study posterior edge loading in unrestricted kinematically aligned total knee arthroplasty in three medially conforming insert designs

**Purpose:** Posterior edge loading following a total knee arthroplasty is a concerning event, and the different kinematic activities used to study the phenomenon could impact posterior edge loading incidence more than insert characteristics such as PCL retention and tibial insert articular surface conformity. As deep knee bend is the most studied activity under fluoroscopy but is less frequently performed by Caucasians than step-up, the purpose of this study was to determine whether posterior edge loading incidence is significantly greater in deep knee bend than step-up to see whether deep knee bend is appropriate for studying posterior edge loading. A secondary purpose was to assess the effects of insert medial conformity and PCL retention on the incidence of posterior edge loading for these two activities.
**Methods:** A dataset was compiled of 63 patients with unrestricted kinematically aligned total knee arthroplasty containing three types of inserts which varied in medial conformity and PCL retention. Patients performed deep knee bend and step-up activities while fluoroscopic images were taken throughout the full range of flexion for these two exercises. After 3D model to 2D image registration, anterior-posterior positions of the femoral condyles with respect to the medial dwell point of the insert were determined and used to find internal tibial rotation. Incidence of posterior edge loading was compared between the three groups and between the two activities.
**Results:** Posterior edge loading incidence during the deep knee bend activity compared to step-up was higher for the ball-in-socket insert conformity insert with PCL retention (7/25 vs 0/24, p=.0096*) and the intermediate conformity insert with PCL retention (12/42 vs 4/42, p=.0495*), and was the same for the ball-in-socket conformity insert with PCL resection (10/25 vs 3/25, p=.0507). There was no significant difference in posterior edge loading incidence between the three insert designs within the same activity.
**Conclusions:** In unrestricted kinematically aligned total knee arthroplasty, the deep knee bend activity should not be used to assess posterior edge loading incidence differences for these inserts, as it is a relatively infrequent activity of daily living compared to step-up and it significantly increased posterior edge loading incidence regardless of insert characteristics.

**Abstract # B36**

**Type of presentation: Poster**

**Authors:** Brian Gao[1], Teimour Nasirov[2,3], Allen Dang[1], Lynne Benish[4,5], Marlene Cook[4,5], Jeffry Jones[4], Robert Kincade[5], Jeffery Paillon[5], and Baljit S. Gill[4]
[1]California Northstate University College of Medicine, Elk Grove, CA
[2]Sutter Medical Center, Pediatric Cardiac Surgery, Sacramento, CA
[3]Stanford University Hospital, Pediatric Heart and Lung Surgery, Palo Alto, CA
[4]Sutter Medical Center, Critical Care Medicine, Sacramento, CA
[5]Sutter Medical Center, Cardiac Surgery, Sacramento, CA.

**Title:** Rapid Expansion of VV-ECMO Support during the COVID-19 Pandemic: Experiences from a Community Hospital

**Study Objective:** Acute respiratory distress syndrome (ARDS) secondary to profound hypoxemia is a life-threatening complication of COVID-19. According to World Health Organization guidelines, patients with ARDS refractory to conventional mechanical ventilation may be recommended for venovenous extracorporeal membrane oxygenation (VV-ECMO). This study reports the clinical outcomes of an adult VV-ECMO program that was established in just 4-weeks at Sutter Medical Center, Sacramento (SMCS). The program was launched to address increasing patients presenting with acute respiratory failure due to COVID-19.
**Methods:** SMCS supported urgent preparedness to add VV-ECMO therapy to their existing, nurse-run adult venoarterial ECMO (VA-ECMO) program. ICU nurses were trained to run VV-ECMO through an interdisciplinary training pathway with experienced VA-ECMO nurses, perfusionists, intensivists, cardiovascular surgeons, and other providers (e.g. nurse practitioners, physician assistants). Retrospective data on VV-ECMO therapy outcomes were collected between November 2020 and June 2022.
**Results:** 29 patients with ARDS due to COVID-19 received VV-ECMO. Of the 29 patients were 23 males and 6 females, of median age 48 (IQR 38-53) years and median body mass index (BMI) 31.4 kg/m2 (IQR 27.1-36.6). The mean duration of VV-ECMO was 970 hours (44.1 days) and the longest run time was 2752 hours (114.6 days). Patient survival rate to VV-ECMO explant was 66%. Patient survival to discharge with a return to functional capacity was 55%, defined as supplemental oxygen requirements less than 3L nasal cannula and rehabilitating to activities of daily living
**Conclusions:** In the setting of the COVID-19 pandemic, an adult VV-ECMO program was rapidly and successfully implemented in an advanced community hospital system. The SMCS VV-ECMO program results are comparable to programs at major academic centers, with survival rates on par with statistics reported by the Extracorporeal Life Support Organization (ELSO) registry. These outcomes demonstrate that nurse-run VV-ECMO programs can offer efficacious rescue therapies for COVID-19-related ARDS.

# Poster Presentations: College of Pharmacy

**Abstract # A38**

**Type of presentation:** Poster

**Authors:** Sanel Velic[1], Grant Van Tran[1], Jaspreet Kaur[1], Quoc-Anh Tran[1], Nhi Duong[1], Vy Tran Luu[1], Hou Mai Xiong[1], Tram Bui[1], Ludmila Nicov[1], Melanie Rose[1] and Linh Ho[1]
[1]College of Pharmacy, California Northstate University

**Title:** Astragaloside-IV and Formononetin As Sirt3 modulators Protect Hepatocytes Against Oxidative Stress

**Objectives**: Sirtuin-3 (Sirt3) has a critical role in reactive oxygen species detoxification. This study explores the roles of astragalaside IV (AST-IV) and formonectin (FMR) for potential antioxidative effects. **Methods:** AML12 hepatocyte cells were cultured and treated with various concentrations of AST-IV or formononetin for assessments. We treated cells with 3 different conditions. In the pre-treatment group, cells were treated only before oxidative stress was induced by 250 μM of t-BHP. In the post-treatment group, cells were treated only after oxidative stress induction. The pre- and post-treatment group treated the cells both before and after oxidative stress induction. Cell proliferation, ROS levels, SOD and GSH activity were assessed. We also measured PGC-1α (peroxisome proliferator-activated receptor gamma coactivator 1-alpha) and AMPK (5' AMP-activated protein kinase) by immunoblotting. Superoxide dismutase 2 (Sod2), catalase (Cat), nuclear factor erythroid 2-related factor 2 (Nrf2), kelch-like ECH-associated protein 1 (Keap1), and glutathione peroxidase 1 (GPX1) were identified by quantitative PCR. **Results:** The pre- and post-treatment group with AST-IV and FMR at all concentrations statistically increased and rescued cell proliferation. Pre-treatment with AST-IV or FMR or post-treatment with AST-IV did not affect ROS levels. However, post-treatment with FMR all resulted in significant increases in ROS. Pre- and post-treatment with AST-V at 5 and 10 μM, FMR at 5 and 20 μM resulted in significant decreases in ROS levels. Pre- and post-treatment with AST 10 μM resulted in a significant increase in SOD activity. Transcriptional levels of Sod2, Cat, Nrf2, Keap1, and GPX1 were increased in treated cells. Furthermore, AST-IV and FMR activated PGC-1α and AMPK as well as SIRT3 expression on t-BHP induced oxidative stressed AML12 hepatocytes, especially at high concentration of FMR. **Conclusions:** AST-IV and FMR yielded antioxidant effect protecting hepatocytes against oxidative stress through induction of SIRT3 protein expression and activation of antioxidant mechanism as well as mitochondrial biogenesis. The findings suggest these agents as SIRT3 modulators can be used in treating oxidative injury hepatocytes.

**Abstract # A39**

**Type of presentation:** Poster

**Authors:** Tanoy Sarkar**[1]**, Sakib M. Moinuddin**[1]**, Fakhrul Ahsan**[1]** and Dipongkor Saha**[1]**
[1]College of Pharmacy, California Northstate University

**Title:** Catheterization of Pulmonary and Carotid Arteries for Concurrent Measurement of Mean Pulmonary Arterial (mPAP) and Systemic Arterial Pressure (mSAP) in PAH Rats

**Abstract:** Pulmonary hypertension (PH) is a group of pulmonary vascular disorders in which mean pulmonary arterial pressure (mPAP) becomes abnormally high because of various pathological conditions, including remodeling of the pulmonary arteries, lung and heart disorders, or congenital conditions. Various animal models, including mouse and rat models, have been used to recapitulate elevated mPAP observed in PH patients. However, the measurement and recording of mPAP and mean systemic arterial pressure (mSAP) in small animals require microsurgical procedures and a sophisticated data acquisition system. In this paper, we described the surgical procedures for right heart catheterizations (RHC) to measure mPAP in rats. We also explained the catheterization of the carotid artery for simultaneous measurement of mPAP and mSAP using the PowerLab Data Acquisition system. We enumerated the surgical steps involved in exposing the jugular vein and the carotid artery for catheterizing these two blood vessels. We listed the tools used for microsurgery in rats, described the methods for preparing catheters, and illustrated the process for inserting the catheters in the pulmonary and carotid arteries. Finally, we delineated the steps involved in the calibration and setup of the PowerLab system for recording both mPAP and mSAP. This is the first protocol wherein we meticulously explained the surgical procedures for RHC in rats and the recording of mPAP and mSAP. We believe this protocol would be essential for PH research. Investigators with little training in animal handling can reproduce this microsurgical procedure for RHC in rats and measure mPAP and mSAP in rat models of PH. Further, this protocol is likely to help master RHC in rats that are performed for other conditions such as heart failure, congenital heart disease, heart valve disorders, and heart transplantation.

**Abstract # A40**

**Type of presentation:** Poster

**Authors:** Ashim Malhotra[1], Milosz Blyszczek[1], Anand Singh[1] and Kunal Kanani[1]
[1]College of Pharmacy, California Northstate University

**Title:** Curricular and Co-Curricular Strategies to Embed the "Industrial Pharmacy" Professional Identity for PharmD Learners

**Study Objectives.** "Big Pharma" is a specialized niche with defined roles and responsibilities and specific professional identities of pharmacists. A gap exists in most PharmD programs concerning industry pharmacy-related curricular and co-curricular learning. To bridge this educational gap and embed the industry pharmacists' professional identity, we developed, implemented, and assessed a seamless curriculum and co-curriculum focused on industry pharmacy. **Methods.** Based on the work of Hartman et al. (AJPE, 2014), we identified the essential themes and components for an industry pharmacy elective course. Three industry experts from regulatory, medical, and clinical affairs and a pharmacy educator with nearly two decades of academic experience carefully created an elective course proposal. A two-credit hour online elective course called ELC785 was designed to incorporate 1) the key aspects of the structure, function, and activities of the pharmaceutical industry, 2) the diverse roles and functions performed by pharmacists in the pharmaceutical industry, and 3) developing students' communication and interpersonal skills. Additionally, we created complimentary co-curricular presentations on career paths for Medical Science Liaison by collaborating with Novo Nordisk and RevHealth pharmaceutical companies.
**Results.** ELC785 is now in its third year with increasing course enrollment, 8, 20, and 34 students over three years. Learners gain knowledge about 1) the drug discovery process, 2) medical affairs including medical information, communication, and MSL, 3) medical affairs strategy and competitive intelligence, 4) regulatory affairs, 5) marketing and sales, 6) clinical affairs, and 7) business development. Students need to develop multiple short projects for in-class assignments related to each subspecialty. A student team Capstone project incorporating all aspects of the development of a new drug application is due at the end. **Conclusion.** CNUCOP student members of the Industry Pharmacy Organization (IPhO) won the second prize in the national 2022 IPhO competition and knowledge on pre-and post-tests shows enhancement.

**Abstract # A41**

**Type of presentation:** Poster

**Authors:** Jennifer Courtney[1], Kelsea G. Aragon[2], Monica Douglas[3] and Ashim Malhotra[1]
[1]College of Pharmacy, California Northstate University
[2]University of New Mexico College of Pharmacy, Albuquerque, New Mexico
[3]Touro University College of Pharmacy, Vallejo, California

**Title:** Embedding LGBTQIA+ Patient Care in the Professional Identity of Community Pharmacists By Creating a Comprehensive Resource Compendium

**Study Objectives.** Cultural, clinical, social, and legally competent patient care for lesbian, gay, bisexual, transgender, queer, intersex, and asexual (LGBTQIA+) patients are currently scarcely incorporated in pharmacy curricula. Here, our objectives were to 1) systematically review the literature using PRISMA guidelines to identify trends in community pharmacists' professional identity development related to the provision of competent LGBTQIA+ patient care and 2) create a reference guide for community pharmacists for self-directed learning. **Methods.** The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA, http://www.prisma-statement.org/ (accessed on 07 June 2022)). A research team consisting of individuals with over a combined 24 years of expertise in community-based pharmacy practice and over 6 years of providing gender-affirming and LGBTQIA+ care was formed to conduct the literature review. The literature search focused on four professional identity domains common to most pharmacists: academic and clinical competence, cultural sensitivity, knowledge of state and federal laws, and continuing professional development. **Results.** A total of 207 articles were identified, with 93 retrieved, of which 26 articles were included in the final analysis based on title and abstract and other inclusion criteria. Professional identity domain results were as follows: Professional domain 1-clinical training (n = 9), 2) domain 2-cultural competence (n = 13), 3) domain 3-patient advocacy and legislation (n = 3), and 4) domain 4-continuing professional development (n = 2). **Conclusions:** The LGBTQIA+ health professions literature focused on the following themes: guidance for appropriate drug selection and therapy, creation of cultural sensitivity training curricula, community pharmacists' perceptions of their ability to provide LGBTQIA+ care, health system interventions, and Allyship education for advancing LGBTQIA+ care, the need for enhanced training of pharmacists for understanding the federal and state laws and requirements while providing care, and the need for a resource compendium.

**Abstract # A42**

**Type of presentation:** Poster

**Authors:** Yasmin Elsobky[1, 2], Welly Mente[3], Eugene Kreys[3] and Islam Mohamed[3]
[1]Alexandria University
[2]NAPHS Consultancy
[3]College of Pharmacy California Northstate University

**Title:** Decoding Medication Tradenames; an innovative Method for Top 200 medications in Didactic & Experiential Courses

**Objective:** To investigate whether decoding of top 200 medication tradenames can result in improving pharmacy students' performance in IPPE-didactic & experiential courses. For ex: Macrobid®; provides an elegant explanation of (MACRO) size crystal form of (Macrodantin) designed for slower absorption & less excretion, hence, used twice daily (BID). **Methods:** An educational intervention of decoded tradenames (explanation of techniques used in top 200 tradenames) was implemented using Quizlet & summary- tables before the summative final exam in a first-year didactic IPPE course. Aggregate de-identified students' scores were used for blinded-paired statistical-analyses. A Likert-scale-surveys was used for evaluating students' quality of learning experience after both the IPPE-didactic and experiential rotations courses. **Results:** In aggregate analyses from Fall 2019-2020; paired data analyses using Wilcoxon test showed a statistically significant increase in average students' performance from 70.6% +/- 18.9% in formative to 80.5% +/- 23.5% in summative assessments after the intervention in control questions involving tradenames without rational explanation (p-value<0.001). Whereas, in questions involving tradenames that have rational explanations, students' performance increased from an average of 58.0%+/-28.3% before the intervention, to 75.9%+/-22.2% afterwards, which represents a net significant difference of 8.1%+/-39.8% between question groups (p-value0.009) (n= 169 students). In addition, at least 80% of students reported that decoding tradenames can help them to retain key medications features & connect it to generic names during didactic course, hence, provide better medication recommendations, & make less potential medication errors during their experiential rotation (n=72/94 students). **Conclusions:** Supplementing pharmacy curricula with the art & science of formulating medication tradenames can improve students' academic performance in didactic courses. Furthermore, it can also improve the resulting quality of healthcare services future pharmacists provide during their experiential education.

**Abstract # A43**

**Type of presentation:** Poster

**Authors:** Eman El-labbad[1], Sherief Khalifa S[1], Reham Khalid[1], Farah Sedki[2], Suzanne Clark[2], Eugene Kreys[2] and Islam Mohamed[2]
[1]College of Pharmacy, Gulf Medical University, [2]California Northstate University, College of Pharmacy

**Title:** Evaluation of an International Collaborative Certificate program for pharmacy student leaders of Peer-assisted learning programs.

**Objective:** Peer-assisted learning (PAL) includes diverse frameworks such as peer tutoring, teaching assistants (TAs), or supplemental instruction (SI). We developed an international certificate training program to introduce essential pedagogical aspects of teaching and learning to PAL student leaders in the Colleges of Pharmacy at Gulf Medical University and California NorthState University. **Methods:** Three synchronous online sessions were delivered for 2.5 hours each covering 9 learning objectives described in 3 themes: an introduction to competency and outcome-based education, the science of learning and memory, and tools to promote learning in PAL programs. 13 faculty and 11 students from both institutions participated in delivering the training program. Pre- and post-session online quizzes were used for assessing the students' knowledge. A 5-point Likert scale analysis was used for measuring students' perceptions of the learning outcomes. **Results:** A total of 42 students providing PAL at both institutions attended the program. Paired T-test analysis indicated a positive improvement in students' knowledge of the learning objectives with significant differences observed after day 1 and day 2 sessions. At least 70% of students indicated that the training program has increased their knowledge level in the addressed domains of mapping their PAL sessions to competency-based learning outcomes, professional identity formation, active learning methods, FERPA regulations, and the application of effective learning and memory tools in their PAL sessions. **Conclusions:** Our Training program led to significant improvement in students' knowledge (Bloom's level 1&2). Further study will assess students' transfer of teaching and learning skills to their tutoring sessions (Bloom's Level 3; Kirkpatrick's level 3&4) measured by a final summative assessment of student's performance delivering mock teaching lessons.

**Abstract # A44**

**Type of presentation:** Poster

**Authors:** Peter Tenerelli[1] and Joanna Jullien[1]
[1]College of Pharmacy, California Northstate University

**Title:** Professional Identity Formation: Results of an Interdisciplinary Instruction

**Study objective:** To determine the impact of an online interdisciplinary presentation regarding Professional Identity Formation for pharmacists, physicians, and dentists. **Methods:** A retrospective analysis was performed on data collected as part of an online interdisciplinary Continuing Education presentation. 107 interprofessional providers attended the activity, with 33 participating in the CE assessments (25 pharmacists, 7 dentists, 1 physician). Pre and post-test assessments were performed to assess Enhancement of Clinician Knowledge via the delta of correct responses before and after the activity, Clinical Willingness to Implement Change via a positive response to do so, and Promotion of Lifelong Learning by assessing if clinicians perceived the training to be meaningful, practical, evidence based, and free from bias. **Results:** Over 90% of participants agreed and strongly agreed that they learned a great deal, found content useful, learning objectives were met, and that the speaker was knowledgeable. 100% of pharmacists and physicians felt that the learning materials were useful and valuable to them, while 86% of dentists agreed with this statement. 96% of pharmacists, 86% of dentists, and 100% of physicians who attended stated that they are willing to make changes to their practice based on the training. 97% of all participants agreed and strongly agreed that the presentation met each learning objective. The aggregate knowledge gain is 10%, with a deficit in the knowledge gain for dentists and physicians. This may reflect that test questions involved some application-oriented scenarios which may have required more time to complete or were more oriented toward pharmacy. **Conclusions:** The Professional Identity Formation online session provided significant impact to an interdisciplinary team of healthcare practitioners as indicated by the participant activity assessments.

**Abstract # B38**

**Type of presentation:** Poster

**Authors:** Sakib M. Moinuddin[1], Tanoy Sarkar[1], Diponggor Saha[1] and Fakhrul Ahsan[1]
[1]College of Pharmacy, California Northstate University

**Title:** Improved Pulmonary Hemodynamics in Rat PAH Model with Fasudil-Lipid-DETA NONOate Admixture and CAR Homing Peptide

Pulmonary Arterial Hypertension (PAH) is a complex and fatal condition similar to cancer. According to the US Food and Drug Administration (FDA), PAH is a rare and life-threatening disease that affects fewer than 200,000 people in the United States. Recently, combination drug therapy has become increasingly popular in treating PAH, as it reduces costs and drug administration while potentially providing a synergistic effect. Our project involves preparing a Fasudil-Lipid-DETA NONOate admixture-loaded CAR homing peptide. We used the Sugen/Hypoxia (SuHx) rat model to test the in-vitro efficacy of our treatment. After six weeks of Sugen-5416 treatment, the rats developed severe PAH with mPAP of 45 mmHg and RVSP of 69 mmHg, and a Fulton Index of 0.48. Right heart catheterization was performed to measure mPAP and RVSP. Treatment with Fasudil, DETA NONOate, or their combination resulted in a 50% decline in mPAP and RVSP compared to the rats treated with saline. The Fulton Index also decreased in all groups receiving anti-PAH drugs. Combination therapy produced a significant reduction in PA wall thickness compared to the Fasudil-treated group. All anti-PAH treatments improved PAT, TAPSE, and RVFWT compared to the rats treated with saline. Our results demonstrate for the first time that Fasudil, DETA NONOate, and their combination admixture loaded CAR homing peptide can improve RV function in rats with PAH.

**Abstract # B39**

**Type of presentation:** Poster

**Authors:** Roopreet Kaur Dab[1], Kevin Brandt[2], Cafrey Feng[2], Raymond Huang[2], Alexander Swanberg[2], Roslyn R. Isseroff[3] and Justin Lenhard[2]
[1]College of Medicine California Northstate University
[2]College of Pharmacy California Northstate University
[3]Department of Dermatology, UC Davis Medical Center

**Title:** Potential synergy of fluoxetine and antibacterials against skin and soft tissue pathogens

**Background:** Fluoxetine has been studied as a topical adjuvant that assists with the healing of wound infections; however, the ability of fluoxetine to potentiate the activity of antibacterials against skin and soft tissue pathogens is poorly defined. **Methods:** Four clinical wound infection isolates (two Staphylococcus aureus and two Pseudomonas aeruginosa) and a reference strain for S. aureus (COL) and P. aeruginosa (PA01) were investigated. Vancomycin, linezolid, clindamycin, levofloxacin, and gentamicin were used in experiments involving S. aureus, whereas levofloxacin, gentamicin, ceftazidime, and polymyxin B were evaluated against P. aeruginosa. Synergy was first assessed using a checkerboard methodology, where a fractional inhibitory concentration index value (FICI) ≤0.5 indicated synergy, a value >0.5 but <4 indicated indifference, and a value ≥4 indicated antagonism. If synergy was detected in the checkerboard analysis, the drug combination was then assessed in 24-hour time-killing experiments. **Results:** All three S. aureus isolates possessed a fluoxetine MIC of 64 mg/L, whereas the fluoxetine MICs of Pa01 and the two clinical P. aeruginosa isolates were 256 mg/L, 256 mg/L, and 512 mg/L, respectively. In the checkerboard analysis, the FICI of fluoxetine and each antibacterial ranged from 0.56 to 1.4 against all three S. aureus isolates. Similarly, the FICI values for levofloxacin, gentamicin, and ceftazidime against the three P. aeruginosa isolates ranged from 0.53 to 1.1. In contrast, the combination of fluoxetine and polymyxin B yielded FICI values of 0.31, 0.19, and 0.38 against Pa01 and the two clinical P. aeruginosa isolates, respectively. In the time-kill analysis, the combination of fluoxetine and polymyxin B eradicated all the P. aeruginosa isolates by 24 hours, whereas each drug individually resulted in bacterial counts of >10^5 CFU/ml. **Conclusion:** The combination of fluoxetine and polymyxin B was synergistic against P. aeruginosa. Further evaluation of fluoxetine and polymyxins may be helpful for countering difficult-to-treat pathogens.

**Abstract # B40**

**Type of presentation:** Poster

**Authors:** Erika Titus-Lay[1], Jeffrey Nehira[1], Jennifer Courtney[1], Jacquelyn Jee[1], Marissa Kumar[1], Jenny Tiet[1], Vivi Le[1], Blythe Durbin-Johnson[2], Moon S. Chen[2] and Ruth Vinall[1].
[1]College of Pharmacy, California Northstate University
[2]UC Davis Comprehensive Cancer Center

**Title:** A Pharmacist-Led Study: Impact of the Covid-19 pandemic on factors relating to cancer health outcomes and disparities.

**Study Objectives:** The objective of this study was to identify Covid-19 pandemic-driven changes relating to healthcare and lifestyle that could potentially impact cancer health outcomes and disparities in our diverse community. **Methods:** A survey study was conducted over a 10-day period at a public Covid-19 vaccination clinic held at California Northstate University (CNU) in March, 2021. Participant demographics, zip code, and Covid-19-driven changes for the following cancer health outcomes-related factors were captured: postponement of cancer screenings, cancellation of medical appointments, tobacco and marijuana usage, consumption of fruits and vegetables, and consumption of alcohol. ANOVA and Chi-squared analyses were performed to identify race and ethnicity-related differences. **Results:** A total of 949 people out of an estimated 1,540 people participated in this survey study (61.6% participation rate). Ninety-three completed surveys were removed based on our inclusion criteria (age 18 or older). Our data indicate that the Covid-19 pandemic had a negative impact on several factors associated with cancer outcomes: many participants reported postponement of cancer screenings and cancellation of medical appointments as well as decreased physical activity and increased tobacco and marijuana usage. Positive impacts were also observed: participants reported increased consumption of fruits and vegetables and decreased consumption of alcohol. Several race-related differences but no ethnicity-related differences were observed. **Conclusion:** Our data can be used to help support and guide targeted outreach in our community and beyond and thereby help mitigate worse cancer health outcomes and disparities.

**Abstract # B41**

**Type of presentation:** Poster

**Authors:** Tanoy Sarkar[1], Sakib M. Moinuddin[1], Dipongkor Saha[1] and Fakhrul Ahsan[1]
[1]College of Pharmacy, California Northstate University

**Title:** Preparation and scale-up of liposomal amphotericin B formulation and a comparison with commercially available counterpart, Ambisome®

The current study was designed to investigate the development of an Ambisome formulation using a Good Manufacturing Practice (GMP) flow machine for large-scale production. Ambisome is a liposome-encapsulated drug commonly used for the treatment of various diseases and the large-scale production of liposomes is necessary to meet the demands of clinical applications, commercialization, cost-effectiveness, and quality control. Therefore, the development of scalable production methods is crucial for the advancement of liposome-based drugs. The optimization was performed by developing the design of different micro-vortex mixers, testing various drug-to-lipid ratios and mixer speeds, solvent removal procedures, and lyophilization. The optimized Ambisome formulation was then characterized for its physical and chemical properties, including particle size, zeta potential, encapsulation efficiency, and stability. The results revealed that the optimized formulation had a mean particle size of 80 nm, a positive zeta potential of +20 mV, and an encapsulation efficiency of over 80%, indicating good stability. Further stability testing demonstrated that the formulation remained stable for a period of more than 3 months when stored at 4°C. The morphological characteristics of the liposomes were determined using Transmission Electron Microscopy (TEM) to obtain high-quality images of the particles, providing valuable information on their size, shape, and distribution. In addition, the results obtained using Circular Dichroism (CD) indicated that the liposomes showed excellent conformation and stability, providing valuable information on their secondary structure. In conclusion, the study successfully developed an Ambisome formulation using a GMP flow machine and the use of this machine ensures consistent and reproducible production, making it suitable for commercialization and clinical use.

**Abstract # B42**

**Type of presentation:** Poster

**Authors:** Preetinder Sohal[1], Ashley Yuen[2], Neelu Batra[1] and Ruth Vinall[1]
[1]College of Pharmacy, California Northstate University
[2]College of Medicine, California Northstate University

**Title:** Neem's ability to decrease proliferation of prostate cancer cells

**Study Objectives:** The main objective of this study was to determine whether Neem (Azadirachta indica, a natural product) can enhance the anti-proliferative effects of standard of care treatments for castration resistant prostate cancer (treatment with Abiraterone, Enzalutamide, and/or Docetaxel). We also placed focus on understanding the mechanisms by which Neem can inhibit prostate cancer cell proliferation. **Methods:** Four prostate cancer cells were used for this study: C4-2, C4-2B, RV1, and PC-3. Clonogenic assay was used to assess the impact of Neem plus Abiraterone, Enzalutamide, or Docetaxel on cell proliferation. Quantitative RT-PCR was used to assess the impact of treatments on enzymes and transporters which are part of the androgen synthesis pathway. **Results:** Treatment with Neem plus Abiraterone resulted in the biggest reduction in clonogenic potential. qRT-PCR analysis data demonstrated that Neem is able to inhibit SR-B1, a transporter which plays a key role in the testosterone synthesis pathway. **Conclusion:** Our data indicate that treatment with Neem may enhance the ability of Abiraterone to inhibit prostate cancer cell proliferation by inhibiting a component of the testosterone synthesis pathway.

**Abstract # B43**

**Type of presentation:** Poster

**Authors:** Robert Moir[1] and Tibebe Woldemariam[1]
[1]College of Pharmacy, California Northstate University

**Title:** Analysis of Cytotoxic Effects of Selected Herbal Extracts on Cancer Cell Lines

**Study Objectives:** Plants are well known for their ability to make a variety of cytotoxic compounds to deter predation. Two herbs/mixes, Lianhua Qingwen (mix) & Blue Cohosh, with a history of use (upper respiratory infections and a contraceptive respectively) had their extracts examined for potential cytotoxic effects. **Methods:** Two cell lines were used, PC3 a pancreatic cell line, and CT26-WT a colon cancer cell line. Both were grown in RPMI with 10% FBS and 1% pen/strep. A CCK-8 viability assay was used to determine the viability of cell culture once the culture was ~90% confluent. **Results:** LQ failed to have any repeatable cytotoxic effects across four trials. However, the polar and nonpolar extracts of BC did have a noticeable degree of cytotoxic ability. The fraction in question had four major alkaloid components with the most prevalent being methylcytisine. The extract in question reliably killed ~50% of cells at 300 µg/mL.
**Conclusions:** LQ is known to be well tolerated in healthy adults, but there was some hope that cancerous cells could be sensitive to one of the components of the herbal mix. Unfortunately this does not seem to be the case. However blue cohosh did show some promise. However, that it is cytotoxic is not too surprising considering its historical use is known to have toxic side effects. Further research is needed first to determine which particular alkaloid or combination of alkaloids is the cause. Second work is needed to narrow down the method of action.

**Abstract # B44**

**Type of presentation:** Poster

**Authors:** Karim Pajazetovic[1], Tibebe Woldemariam[1] and Ashim Malhotra[1]
[1]College of Pharmacy, California Northstate University

**Title:** Repurposing FDA-approved Antitubercular Agents Isoniazid and Ethambutol in Pancreatic Adenocarcinoma

**Study Objectives.** Pancreatic Ductal Adenocarcinoma (PDAC) annually kills 67,000 Americans and 250,000 people worldwide. It is a challenging incurable disease. Mutations in the human homolog of the Kirsten Rous Sarcoma (K-RAS) viral oncogene are observed in 90% of PDAC patients. However, the molecular mechanisms downstream of K-RAS gene mutations causing mitochondrial alterations which possibly drive the chemoresistance of PDAC remain unknown. Our aim was to investigate repurposing FDA-approved antitubercular agents as molecular probes in preclinical PDAC models to identify druggable mitochondrial targets. **Methods.** A systematic literature analysis involving Boolean searches and approximating the PRISMA guidelines was performed and isoniazid was selected. The K-RAS mutant human PDAC cell lines, PANC-1 and MIA PaCa-2 were seeded in six-well plates (500,000 cells per well), attached overnight, and treated with 10, 20, 30, 40, and 60 µM aqueous isoniazid for 24 or 48 hours. Isoniazid was obtained from Dr. Tibebe Woldemariam as an in-kind contribution who also tested the stability characteristics of the aqueous solution of isoniazid using HPLC. **Results.** A review of the existing literature using PubMed revealed that “Isoniazid cancer” produced 813 results, 228 when paired with “carcinoma, 8 when paired with “pancreatic cancer”, 3 when paired with “pancreatic carcinoma”, and zero when paired with pancreatic adenocarcinoma”. Furthermore, a similar search in Google Scholar found that “Isoniazid cancer” produced 54,700 results, paired with “carcinoma” produced 24,900 results, paired with “pancreatic cancer” produced 12,300 results, paired “pancreatic carcinoma” produced 7,260 results, and paired with “pancreatic adenocarcinoma” produced 2,510 results, suggesting evidence for isoniazid’s cytotoxicity in PDAC. The CNUCOP Summer Research Fellowship allowed preliminary investigations demonstrating that treating cultured MIA PaCa-2 cells with increasing doses of aqueous isoniazid ameliorated cell viability by 30% at 30µM. **Conclusion.** Isoniazid may potentially be repurposed to induce cytotoxicity in PDAC cell lines pending future mechanistic analysis.

**Abstract # B45**

**Type of presentation:** Poster

**Authors:** Chrislyn Lawrence[1] and Eugene Kreys[1]
[1]College of Pharmacy, California Northstate University

**Title:** The Association Between Pharmacy School Characteristics and Performance Outcomes over a 5-Year Period

**Study objective:** The objective of this study is to identify an association among certain characteristics of pharmacy on performance outcomes. **Methods:** We conducted a retrospective analysis to identify an association among multiple variables including private vs. public, established pre vs. post 2000, accelerated vs. traditional pharmacy programs, region of the country, bachelor's degree requirement, part of healthcare center and outcomes of pharmacy school performance including NAPLEX pass rates, MPJE pass rates, and PGY1 match rates from 2017 to 2021 of all pharmacy school. School characteristics were obtained from PharmCAS. NAPLEX and MPJE pass rates were obtained from the National Association of Boards of Pharmacy (NABP). PGY1 match rates were obtained from the American Society of Health-System Pharmacists (ASHP). Repeated measures two-way ANCOVA were performed to determine possible association between school characteristics and performance outcomes as well to control for confounding. **Results:** One hundred forty-one US pharmacy schools were analyzed. Fifty-one percent were private, 40.4% were established after 2000; 87.2% delivered a traditional program, 95.7% did not require a bachelor's degree; 55.3% were not a part of a healthcare center. It was determined that NAPLEX all-time pass rate demonstrated a statistical difference between geographic regions ($p = 0.038$). All other variables showed no statistical difference. Significant association was also identified between region and PGY-1 match rates ($p = 0.028$). No other significant associations were identified between school characteristics and performance outcomes. **Conclusion:** The region of the country was the only school characteristic that demonstrated a significant association performance outcomes.

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## Poster Presentations: College of Health Sciences

**Abstract # A45**

**Type of presentation: Poster**

**Authors**: Rohan Datir[1], Alec Landau[1] and Dr. Kit Keane[1]
[1]College of Health Sciences, California Northstate University

**Title**: Territorial Dynamics and Mating Strategies in the Carpenter Bee Genus Xylocopa

Despite the presence of a whopping 4000 species of native bees in North America, most remain poorly studied. Male carpenter bees in the genus Xylocopa are famous for their aggressive territorial behavior in which they hover in the air and intercept any small objects which enter their airspace, including but not limited to female bees, male competitors, small rocks thrown toward them, and even human heads. Male competition has long been identified as a key component driving variation in mating systems, so by exploring the dynamics of male-male interactions, we hope to develop a deeper understanding of how bee mating systems fit into the existing theory.
Specifically, our objectives are to determine what criteria males use to choose territories as well as ascertain whether there is variation in territorial/reproductive strategies with respect to male size (a rough indicator of male quality). For example, are larger males better able to defend more desirable territories? In most species of Xylocopa, males patrol territories based on availability of females – often near either floral resources or female nesting sites. In order to explore the decision processes involved in male territoriality behavior, we perform a basic mark-recapture study. We then utilize network analysis constrained by the spatial location of territories and analyze whether there are patterns guiding males movement between sites.
Predictably, results suggest that the most desirable territories are those closer to a greater number of female nests. But interestingly, male movement between territories is highly complex, with some males monopolizing desirable territories and others adopting a more nomadic and opportunistic approach.

**Abstract # A46**

**Type of presentation: Poster**

**Authors**: Amidala Geetaumesh[1] and Nicholas Valley[1]
[1]College of Health Sciences, California Northstate University

**Title**: Turning Telomerase Off

Cancer is not one disease: any tumor may be the result of one or many pathways that manifest in a dysfunctional cell cycle. One causative pathway includes the activity of the enzyme telomerase, which regulates the relative age of the genetic material within a cell. Telomerase is an active enzyme before birth, and its overexpression is related to cellular replicative immortality, a hallmark of cancer. Therefore, drugs that target telomerase may prove to supplement or enhance chemotherapeutic treatment. The first objective was to collect data on ligands that competitively inhibit telomerase function for chemotherapy drug design. Current telomerase inhibitors include BIBR1532, which is not readily bioavailable. Six thousand ligands from NCBI's Molecular Database were tested for telomerase active site binding using AutoDock Vina. The inhibitor candidates were analyzed for their ligand–enzyme interaction strength in Chimera, relative drug-likeness using SwissADME, and toxicity using the Toxicology Estimation Software Tool. BIBR1532 was used as a positive control throughout all calculations, and a scaled score was assigned to each tested ligand to determine the most promising inhibitor candidate. While most inhibitor candidates that bound strongly to the telomerase active site exhibited toxicity, ligand NCI2968 shows great potential due to its strong enzyme interaction and drug-likeness. Critical to overcoming the adaptive rewiring of cancer cells' survival response to drugs, the collected data may be used to develop new drugs that target alternative cancer pathways. The second objective was to inspire high school students interested in healthcare by educating them on this project's research. Arthur A. Benjamin High School students in Sacramento engaged in games, discussions, and informative illustrations to learn more about the breadth of scientific research. As strides are made in cancer development, encouraging the future generation to approach large issues in healthcare through scientific research becomes an important goal.

**Abstract # A47**

**Type of presentation: Poster**

**Authors**: Hassan, Yusuf[1], Sandhu, Sukmin[1] Dr. Nicholas Valley[1]
[1]College of Health Sciences, California Northstate University

**Title**: Controlling Asthma: Rooting Around for Safer Alternatives

Asthma is a chronic disease with no cure, however its symptoms can be reduced and diminished through various treatments. Quick relief medications such as inhalers are most common, however they only treat symptoms temporarily. Long term medications can be prescribed to reduce the severity of asthma symptoms over time, reducing dependence on quick relief drugs and inhalers. This project focused on finding an alternative drug toTheophylline, a current long-term bronchodilator with bad side effects. One of the major downsides of this drug is that it is only effective in high dosages, which leads to adverse side effects. The two main drug targets of Theophylline are phosphodiesterase enzymes (PDE4) and adenosine receptors. According to previous studies, the adenosine receptor antagonism of Theophylline was the main cause of the adverse side effects. Thus, the main goal was to design molecules that would be more selective to PDE and avoid adenosine receptors. First the drug targets were analyzed using RCSB protein data bank and Chimera, by looking at important active site residues, surface interactions, and baseline interactions with theophylline and similar drugs. Then, Avogadro was used to design 200 new molecules based on the analysis. Next, the binding affinity of each new molecule was obtained using Autodock Vina. Lastly, the 10 molecules with the greatest difference in binding affinity favoring PDE over adenosine receptors were noted. The 10 molecules were then assessed in Swiss ADME and narrowed down to the two best molecules based on polarity, size, and branching. The two best molecules have potential for long term asthma treatment, however must go through further testing. In regards to community outreach, a children's picture book was created that illustrated Asthma, its available treatments, and computational drug discovery in a simplified manner.

**Abstract # A48**

**Type of presentation: Poster**

**Authors**: Alec Landau[1], Vivian Zhu[1], Chetan Yarlagadda[3], Akshay Reddy[2], Mohamed Abutineh[4], Matthew Corsi[5], Ali Idriss[3], Gordon Akraji[1], Telak Bhrahmbatt[1] and Rakesh Patel[6]
[1]College of Health Sciences, California Northstate University
[2]California University of Science and Medicine
[3]Florida Atlantic University Charles E. Schmidt, College of Medicine
[4]Edward Via, College of Osteopathic Medicine
[5]Wayne State, School of Medicine
[6]East Tennessee State University Quillen College of Medicine

**Title**: The Adverse Effects of Delayed Diagnosis on Survival Rates in Osteosarcoma Patients Treated with ERBT

Osteosarcomas are a type of bone cancer most commonly found in the bones in the extremities. It occurs most in teenagers and young adults. Treatment typically involves some combination of chemotherapy, radiotherapy, and/or surgery. The most commonly used radiotherapy to treat cancer is external beam radiation therapy (ERBT). ERBT consists of speeding up charged photons, X-rays and gamma rays, protons, and/or electrons directed at tumors to induce apoptosis. The evaluation of treatment success on osteosarcomas is monitored using diagnostic imaging techniques. The objective of this literary analysis is to analyze the relationship between osteosarcomas and ERBT. Furthermore, the relationship between delay of diagnostic imaging was compared against survival rates to determine whether additional follow-up care of cancer survivors is necessary. Studies with innovative uses of ERBT and unique locations of osteosarcomas using combinations of diagnostic techniques were selected for a comprehensive conclusion in this association. Several case studies and literary analyses fitting the criteria were broken into two categories based on the temporal delay between presentation of symptoms and the time of diagnosis, or lack thereof. The null hypothesis, that the presence or lack of a delay in diagnosis, failed to be rejected for the “Delay” category, but was rejected for the “Lack of Delay” category as the p-value was below 0.05. The T-test result was 3 and roughly 1.6 for the “No Delay” and “Delay” categories, respectively. Therefore, as proven by the p-value and strong association in the t-test, the lack of delay from symptoms to diagnosis was impactful and could result in a positive outcome while a delay did not change the outcome, as this is the standard convention with present follow-up methods. The data and statistical results show additional follow-up care in patients with rare or commonly recurring cancers could benefit outcomes.

**Abstract # A49**

**Type of presentation: Poster**

**Authors**: Kit Keane[1]
[1]College of Health Sciences, California Northstate University.

**Title**: Species diversity and abundance of native bees in an urban mosaic

Recent news has chronicled the precipitous decline of insects worldwide. Interestingly, research is beginning to show that we can still harbor robust insect populations within highly urbanized environments. Bees seem to be an example of this, as surveys find that urban areas are able to maintain relatively high diversity by relying on hotspots of floral resources and nesting habitat (ex. gardens and wild spaces). However, there are questions about whether these urban communities are reflective of native bee assemblages. Additionally, more data are needed to evaluate how these communities are distributed within urban environments, how they are affected by land-use decisions, and ultimately how they are changing over time. We use a GIS-based approach to test for patterns in abundance and diversity of bees collected passively via blue-vane traps with respect to a variety of high-resolution landscape variables. Bees were identified to genus and species level through basic barcoding techniques. Results do not show clear patterns of bee abundance with regards to impervious surface area, as expected, suggesting relationships are more complex. We argue that diversity patterns in highly urbanized environments likely are not representative of those from natural areas due to inherent and fundamental differences in land-use practices.

**Abstract # B46**

**Type of presentation: Poster**

**Authors**: Medha Garg[1], Emaan Rahmanzai[1] and Ravi Ranjan[1]
[1]College of Health Sciences, California Northstate University.

**Title**: The Effects of Stress Eating and Meditation on Stress Levels

Stress is a prevalent biological process, and the mechanism of stress is poorly understood. Coping with stress can be difficult which can lead to problems like anxiety, depression, and hypertension. When dealing with stress, students turn to stress-eating to feel better and decrease their stress/anxiety levels. However, it is possible to relieve stress through other means such as meditation. It was hypothesized that students who meditate (a healthier alternative), as opposed to stress eat (consume unhealthy sustenance), experience a greater decrease in heart rate and blood pressure to return to homeostasis. To test the validity of the hypothesis, a study was conducted to determine the comparative effects of stress eating and meditation on stress levels. The target population of the study was stressed, college students. The stress levels of participants, who were either stress eating or meditating, were measured through systolic blood pressure and heart rate. Through six different trials conducted weekly, it was determined that participants had lower stress levels after stress-eating and experienced a return to a normal physiological state after meditating. The results of the experiment concluded that stressed students who meditate in comparison to stress-eat experience a greater decrease in blood pressure and heart rate that is closer to a normal heart rate and blood pressure. Meditation counters stress eating and normalize hypertension that is created during exam stress. This is particularly important to implement in college life, as even a short period of meditation can be proven to lower stress levels before an exam.

**Abstract # B47**

**Type of presentation: Poster**

**Authors**: Zara Adnan[1], Jannat Naveen[1] and Ravi Ranjan[1]
[1]College of Health Sciences, California Northstate University.

**Title**: Heart Rate Variability & Coloring Reducing Stress

The effects of long-term stress can be drastic on one's health, causing problems such as mental illness and cardiovascular disease. In order to alleviate stress, the act of coloring can potentially be a source to allow physical and mental stress relief, leading to the question: To what extent does the act of coloring help an individual calm down after experiencing unease or being afraid? There is a lack of research into how heart rate variability (HRV) is involved with the increase and decrease of immediately-induced stress by coloring. The proposed experimental methodology conducted, tested the hypothesis that the act of coloring will increase the HRV until it is close to normal after having the HRV decrease due to discomfort or stress. Within 6 weeks, the sampled population of the CNUCHS students were asked to listen to calming music, stress-inducing music, and color for a designated period of time while having their HRV and heart rate measured with an ECG. This research can enhance the physiological understanding of the cardiovascular system within the body as well as increase awareness of the significance of heart rate variability as it is important and relevant to understanding one's own body system. The results indicate an inverse correlation between HRV and stress. Coloring has a stress-relief response as it helps individuals with distress with the indicated increase in HRV levels. Future research opportunities involve color analysis and testing different technological mediums and their stress-relieving effects to eventually provide creative outlets for patients in hospitals.

**Abstract # B48**

**Type of presentation: Poster**

**Authors**: Fayez Fayad, Asghar Shah, Noora Fayad[1], Kelvin Chang, Ethan Snow, Liqi Shu, Shadi Yaghi and Eric D. Goldstein
[1]College of Health Sciences, California Northstate University.

**Title**: The FLAIR Signal Intensity Ratio Predicts Early Neurologic Deterioration for Small Subcortical Infarcts

Study objective: Early neurologic deterioration (END) occurs in nearly 40% of small subcortical infarct (SSI). The majority occurs because of initial infarct completion, leading to significant morbidity. Presently no robust predictive radiographic biomarker for END from SSI exists. The fluid-attenuated inversion recovery signal intensity ratio (FLAIR-SIR) ≥ 1.15 was shown to help differentiate completed infarcts from those with penumbra aiding in identifying those that may benefit from alteplase. We aimed to use the FLAIR-SIR as a biomarker for predicting END from SSI. We hypothesized that those with a higher FLAIR-SIR had less risk of developing END due to infarct completion.
Methods: We retrospectively enrolled individuals seen at Rhode Island Hospital between 2019 and 2022. Those included had a radiographic diagnosis of a SSI per STRIVE criteria. The primary outcome was END diagnosed as ≥ 2-point increase in NIH Stroke Scale score within 24 hours of admission. The primary exposure was FLAIR-SIR, defined as the ratio of ipsilateral FLAIR intensity within the region of infarct divided by the FLAIR of the contralateral identical anatomical location. Standard descriptive and unadjusted regression analyses were used.
Results: 195 individuals were included with a mean age 68 (+/- 13) years, and 59.5% being male. 3.6% experienced END. The mean overall FLAIR-SIR was 1.26 (+/- 0.30) with a mean of 1.26 (+/- 0.34) for those without END and 1.07 (+/- 0.25) for those with END ($p = 0.66$). Using Youden's J index for FLAIR-SIR, the optimal cutoff was determined to be 1.16, with an unadjusted hazard ratio of 0.24 (95%CI 0.047 – 1.26, $p = 0.092$) for END within 24 hours.
Conclusions: FLAIR-SIR measurement above 1.16 may serve as a radiographic predictor of END amongst SSI with evolving infarcts (lower FLAIR-SIR) being more vulnerable to new or worsened neurologic symptoms. Adequately powered prospective studies are needed.

**Abstract # B49**

**Type of presentation: Poster**

**Authors**: Vaniya Qureshi[1], Anuj Budhiraja[2], Shymaa Bilasy[2], Frank Hoang[2] and John Cusick[2]
[1]College of Health Sciences, California Northstate University
[2]College of Medicine, California Northstate University

**Title**: Elucidating the Expression of RELT Family Members in Cancer and their Impact on Cancer Cell Survival

Introduction: Receptor Expressed in Lymphoid Tissue (RELT), a member of the tumor necrosis receptor superfamily, induces cell death within human epithelial cells and inhibits T-cells in mice. RELL1 and RELL2 are paralogs of RELT that physically bind RELT classifying them as RELT family members (RELTfms). A genetic screen identified the actin-binding protein Filamin A (FLNA) as a potential binding partner to RELTfms. Previous reports indicate that RELT binds to MDFIC and is upregulated by TGFβ, two proteins implicated in regulating β-catenin activity. Study Objectives: This study investigates the prevalence of RELTfms in human tissues and cancer cell lines and further elucidates signal transduction pathways involving RELTfms. Methods: Lipofectamine was used to transiently transfect cell lines with expression plasmids, and western blotting was used to detect protein expression. Co-immunoprecipitation and western blotting were used to confirm physical interactions between proteins. Results: RELT and RELL1 are abundantly expressed in human lung, heart, kidney, stomach, liver, and prostate tissues. RELL2 is expressed at highest levels in HEK-293 cells, and cancerous cell lines representing lung and colorectal cancer. RELT and RELL1 physically bind with a C-terminal fragment of FLNA. Preliminary results indicate that RELL2 downregulates phosphorylation of β-catenin and the overexpression of RELTfm may induce cleavage of PARP. Conclusions: Results confirm novel interactions between RELTfms and FLNA, a protein that is strongly implicated in several human cancers. Furthermore, RELTfm expression may induce cleavage of PARP, a DNA repair enzyme cleaved during apoptosis. Preliminary results indicate that RELL2 may stabilize β-catenin, an important step in promoting tumor cell proliferation, migration, and invasion. Currently, we are testing whether mutants of FLNA influence the ability of RELT to activate caspases and other pathways. Our results indicate RELTfm proteins are expressed in many non-lymphoid tissues, indicating that the evolutionarily conserved RELTfms possess additional functions that merit further investigation.

**Abstract # B50**

**Type of presentation: Poster**

**Authors**: Mahitha Ravipati[1], Jayani Villuri[1] and Reem Olaby[1]
[1]College of Health Sciences, California Northstate University

**Title**: Don't Tap into the Tap Water

Hard water is characterized as water containing a large amount of dissolved minerals. Calcium is one of the main components of hard water. Several studies have shown that hard water can potentially cause different neurological disorders, such as Alzheimer's disease (AD), if ingested in a large amount. An abnormal plaque formation in the brain, which is said to be caused by the protein amyloid β-Peptide, can cause AD. It was hypothesized that overconsumption of calcium leads to an increase in production of the amyloid β-Peptide. The production of this protein may lead to the persistence of AD, which is attributed to the consumption of hard water by individuals who drink their tap water. To test this hypothesis, samples of water were taken from eight different areas around the United States: San Ramon, CA, Stockton, CA, Santa Clarita, CA, Sacramento, CA, San Jose, CA, Houston, TX, Deer Valley, TX, and Edison, NJ. Using these water samples, an API Calcium test was performed to determine the calcium concentration for each sample. Each AD patient who was admitted into hospitals within a five-mile radius from the water extraction sites for the past three years were noted down. The hypothesis that there was a positive correlation was confirmed between the number of individuals admitted into the hospitals and the calcium concentrations in the tap water for each area. Individuals with AD were also assessed to determine if the amyloid β-Peptide protein is detected using the Western Blot Analysis. As each case study was completed, it was concluded that the high exposure of neurons to calcium was associated with an increase in amyloid protein production. Research can further be done to see how a decrease in the consumption of Calcium minerals from the tap water can prevent or delay symptoms associated with AD.

**Abstract # B51**

**Type of presentation: Poster**

**Authors**: Jayani Villuri[1], Mahitha Ravipati[1], Medha Garg[1], Sonal Sachdeva[1] and Reem Olaby[1]
[1]College of Health Sciences, California Northstate University

**Title**: New Diet?: Intermittent Fasting

Intermittent fasting involves only eating for a set of hours every day to allow the body to burn calories more efficiently when there is an uninterrupted time period for glucose metabolism. Past research was done to study how intermittent fasting changes the body and its metabolic processes, proving to be particularly helpful for diabetic patients. These studies demonstrated that intermittent fasting can cause an increase in heart rate and a decrease in blood pressure, which is analogous to the effects of performing rigorous exercise. Research has also shown that intermittent fasting can stimulate the production of ketones, which can myelinate the axon of neurons, causing neural signals to transmit faster, resulting in more efficient cognitive functions. The presence of ketones can be detected through a ketone urine test. Therefore, it is hypothesized that intermittent fasting causes more efficient cognitive functions which can be proven by the production of ketones, increased heart rate, and decreased blood pressure. Data was collected from thirty individuals who fasted for eight, twelve, sixteen, and eighteen hour periods. They were given either a mentally or physically exhausting task every week for four weeks. The heart rate and blood pressure of each individual was obtained before, during, and after each task was completed. The efficiency of each individual during the task was assessed using a predetermined scale from one (lowest) to ten (highest). The hypothesis was proven as there were ketones detected in the urine samples as well as an increase in heart rate and decrease in blood pressure. The ketone body and heart rate measurements positively correlated with the cognitive efficiency measured while the blood pressure inversely correlated. As a result, it is proven that the intermittent fasting technique can cause more efficient cognitive functions and should be carried out regularly, especially by diabetic patients.

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**Abstract: # A50**

**Type of presentation: Poster**

**Authors**: Sanam Baidar[1], and Jason Lillis[1]
[1]College of Psychology, California Northstate University.

**Title:** Is Childhood Maltreatment Associated with Alcohol Use in Adulthood

Childhood physical, sexual, and emotional abuse increases the risk for alcohol use disorder. However, most reports of childhood maltreatment are retrospective self-reports, and this increases the risk of false reporting and selection bias in recalling childhood maltreatment. We have decided to further focus our research question by examining the risk of alcohol abuse from the history of childhood maltreatment. Data used for the analysis will come from the National Longitudinal Study of Adolescent Health (Add Health). The variables that will be explored in this study are childhood maltreatment and number of times unable to quit drinking in one month. Biological sex was a variable explored to determine if it affects the potential relationship between childhood maltreatment and number of times unable to quit drinking in one month. A multivariate regression analysis was conducted to determine whether biological sex confounds the relationship between childhood maltreatment category and number of times unable to quit drinking in one month. Our data showed a significant relationship between childhood maltreatment and an inability to quit drinking in one month ($p = .037$). Our research found statistically significant differences between the three levels we assessed. Previous research has demonstrated a relationship between these variables as well. When factoring in biological sex, we found no evidence to suggest that this factor is a confound in our study. Data shows that both, childhood maltreatment ($p=.013$) and biological sex ($p<.001$) are two variables that are measured to be independently associated with an inability to quit drinking for in one month. This information could allow us to further examine the relationship between childhood maltreatment and alcoholism. A future direction could be examining the risk of alcohol abuse from the history of childhood maltreatment by incorporating psychological distress, drinking motives, parental history, and any other co-occurring maltreatments.

**Abstract: # A51**

**Type of presentation: Poster**

**Authors**: Renya Bazikian[1], Robert Mitscha[1], Gurleen Thandi[1], and Jason Lillis[1]
[1]College of Psychology, California Northstate University.

**Title:** The Association Between Childhood Maltreatment and the Frequency of Adulthood Romantic Relationships

Early childhood trauma can affect an individual in a myriad of ways during their developmental stages in life. There is a fascinating link between early experiences and how they manifest over time. Childhood sexual abuse has been associated with greater self-criticism, creating this cycle of avoidance of attachment and unsatisfactory romantic relationships. We specifically wanted to examine childhood maltreatment and if there is a consequence regarding the frequency of future adult romantic relationships. Data used for analysis is from the fourth wave of the National Longitudinal Study of Adolescent Health (AddHealth). Add Health is a nationally representative sample of adolescents and their social environment and health factors (N=5114). An ANOVA was used to examine the association between childhood maltreatment and the total number of partners. In addition, a correlation with a split was used to test biological sex as a moderator. The results indicate that individuals with childhood maltreatment report a higher total number of partners than individuals without maltreatment. There is no moderation between childhood maltreatment and the total number of partners when biological sex is used as a split.

**Abstract: # B52**

**Type of presentation: Poster**

**Authors**: Manraj Garcha[1], Alexander Agramonte[1], Matthew Chan[1], and Jason Lillis[1]
[1]College of Psychology, California Northstate University.

**Title:** Do Demographic Factors Moderate the Association between Sleep and Depression?

**Study objective**: The objective of the study was to investigate whether demographic factors, specifically biological sex and race, moderate the association between sleep difficulty and depression.
**Methods**: Data was analyzed using a nationally representative sample of 5,114 participants, ages 24 to 32, from Wave IV of the National Longitudinal Study of Adolescent to Adult Health (Add Health) in 2008 and 2009. Survey data on various topics, including recent sleep difficulty and current symptoms of depression, was collected using in-home interviews.
**Results**: Bivariate analysis demonstrated that participants who had more trouble falling asleep had a higher mean CES-D Depression Scale total score. Analysis of variance revealed a significant difference between how often participants had trouble falling asleep on CES-D depression score. Moderation analysis with an analysis of variance test indicated that males and females both demonstrated a significant difference in how often they had trouble falling asleep on CES-D depression score. Moderation analysis with chi-square tests of independence revealed that Black or African American and White participants demonstrated a significant association between CES-D depression score and trouble falling asleep, while participants who identified as Multiple Races, American Indian or Native American, Asian or Pacific Islander, and Other did not demonstrate a significant association.
**Conclusions**: Consistent with previous research, symptoms of depression were significantly associated with trouble falling asleep. Biological sex did not moderate the relationship between how often participants had trouble falling asleep and CES-D depression score. Race, however, did moderate the relationship between trouble falling asleep and CES-D depression score, as only Black or African American and White participants demonstrated a significant association. This finding further suggests that Black or African American and White populations may be at greater risk for developing depression due to trouble falling asleep.

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## Poster Presentations: College of Graduate Studies

## Master of Pharmaceutical Sciences program

**Abstract: # A52**

**Type of presentation: Poster**

**Authors**: Fatemeh Shahbazi[1], and Abdelbasset Farahat[1]
[1] Master of Pharmaceutical Sciences, College of Graduate Studies, California Northstate University.

**Title:** Obesity Treatment

In general, obesity is defined as the condition of excessive fat accumulation as the result of an imbalance between consumed calories and the calories expended by physical activity, which presents people at higher risk to further health concerns and contributes to numerous chronic illnesses such as cancers, diabetes, cardiovascular and high blood pressure. Obesity is assessed by the BMI formula and waist circumference (an indicator of central obesity); moreover, a BMI over thirty falls within the obesity range. There are three classes of obesity with class three is a BMI of forty or higher, categorized as severe obesity. Obesity is considered one of the principal public health concerns in developed and developing countries. The primary goal of treatment is weight loss and upkeep it, which can be reached in different ways.The purpose of this review was first to describe the risk factors of obesity to prevent it and compare the efficacy of different kinds of treatments for obesity. Treatment approach include but not limited to dietary changes, behavioral changes, non-surgical procedures, and drug treatments ex. Orlistat, Phentermine-topiramate.The rate of overweight is rapidly increasing and has grown to epidemic proportions and need to take serious actions to prevent and address this issue. According to the prevalence of obesity, the weight-management requires a combination of a range of strategies to achieve the desired loss of body fat with long-term maintenance. The role of a healthy diet and regular exercise in mitigating overweight risk have received the most attention. They are considered an integral part of each treatment method to get a long-lasting effect.

**Abstract: # A53**

**Type of presentation: Poster**

**Author**: Annalia Ferrer[1], and Abdelbasset Farahat[1]
[1] Master of Pharmaceutical Sciences, College of Graduate Studies, California Northstate University.

**Title:** Recent Antipsychotics Medications Used to Treat Schizophrenia: Synthesis and Overview

In this work, we compare the recently approved medications for schizophrenia while analyzing their long-term effectiveness and tolerability in adults suffering from this disease. This work provides an overview of the history of the medical community's understanding of schizophrenia and the different types of symptoms associated with this disease. Additionally, we discuss the theories behind the various environmental and genetic risk factors related to schizophrenia onset. We also compare different types of medications used to treat symptoms of schizophrenia, first-generation antipsychotics and second-generation antipsychotics, and provide an in-depth review of various examples of each category. This work then analyzes the structure, effectiveness, and safety of recent medications approved for treating schizophrenia.

**Abstract # A54**

**Type of presentation: Poster**

**Authors**: Karina Cruz Munos[1], and Adelbasset Farahat[1]
[1] Master of Pharmaceutical Sciences**,** College of Graduate Studies, California Northstate University.

**Title:** Alopecia: Risk Factors and Modern Treatment

Alopecia is the medical term referring to hair loss. This disease is caused by multiple factors due to genetics, autoimmune disorder, psychological stress, and hormones. Alopecia can develop anywhere in the body and ranges in severity from patches to complete baldness. In this article, we will review several categories such as types of alopecia, epidemiology, risk factors, and traditional and alternative treatments. Most types of alopecia don't follow a set pattern of hair loss, but all can bring low self-esteem and high volumes of stress. There is a small percentage of patients who visit a dermatologist and become diagnosed with this disease. With that, a minority of individuals who suffer from alopecia don't get evaluated by a healthcare professional making it difficult to statistically have a percentage of how many people deal with this disease. Unfortunately, there is no set treatment that cures alopecia but there are numerous treatments that have proven to help reverse the effects or slow the progression of alopecia. Currently there has been more intrigue on this disease and more data has been provided to understand the different types of alopecia types (more specifically alopecia areata).

**Abstract # A55**

**Type of presentation: Poster**

**Authors**: Mia C. Borlongan[1], and Hongbin Wang[1]
[1] Master of Pharmaceutical Sciences, College of Graduate Studies, California Northstate University.

**Title:** Profiling and targeting of cancer stem cells as cancer therapeutics

Tumorigenic cancer stem cells (CSCs) represent a subpopulation of cells within the tumor that express genetic and phenotypic profiles and signaling pathways distinct from the other tumor cells. CSCs have eluded many conventional anti-oncogenic treatments, resulting in metastases and relapses of cancers. Effectively targeting CSCs' unique self-renewal and differentiation properties would be a breakthrough in cancer therapy. A better characterization of the CSCs' unique signaling mechanisms will improve our understanding of the pathology and treatment of cancer. In this paper, we will discuss CSC origin, followed by an in-depth review of CSC-associated signaling pathways. Particular emphasis is given on CSC signaling pathways' ligand-receptor engagement, upstream and downstream mechanisms, and associated genes, and molecules. Signaling pathways associated with regulation of CSC development stand as potential targets of CSC therapy, which include Wnt, TGFβ (transforming growth factor-β)/SMAD, Notch, JAK-STAT (Janus kinase-signal transducers and activators of transcription), Hedgehog (Hh), and vascular endothelial growth factor (VEGF). Lastly, We will also discuss milestone discoveries in CSC-based therapies, including pre-clinical and clinical studies featuring novel CSC signaling pathway cancer therapeutics. This review aims at generating innovative views on CSCs toward a better understanding of cancer pathology and treatment.

**Abstract # A56**

**Type of presentation: Poster**

**Authors**: Jackson Donald[1], Madison Spencer[1], Shaumik Patil[1], Michelle Chiu[1], Ashutosh Rai[1], and Abdelbasset Farahat[1]
[1] Master of Pharmaceutical sciences, College of Graduate Studies, California Northstate University.

**Title:** GIT locally Active Antimicrobials

Gastrointestinal (GIT) infections are a leading cause of mortality and morbidity rates in developing countries and the rapid resistance to antimicrobial drugs threatens current and future treatment options. In this review, we will summarize the use of locally-acting gut antibiotics to treat GIT infections. In particular, we will focus on the advantageous mechanism of action of orally administered gut antibiotics that intentionally failed to cross the fatty cell membrane of the gut due to the high hydrophilic character of these drugs. This discussion will be focused on the structure, use, mechanism of action, and current resistance of relevant hydrophilic locally-acting gut antibiotics.

**Abstract # A57**

**Type of presentation: Poster**

**Authors**: Arleigh-Ann Byer[1], and Ahmed El-Shamy[1]
[1] Master of Pharmaceutical Sciences, College of Graduate Studies, California Northstate University.

**Title:** Oncolytic Viruses: The Future of Antitumor Therapy

For oncolytic viruses to be effective, they need to be non-pathogenic and have the ability to selectively target and kill cancer cells. They can also be genetically engineered to transform so that they express anti-tumor factors. The ability of oncolytic viruses to directly infect and destroy tumor cells is what sets it apart from other anti-tumor therapies currently being used. This has potential to be a very specific mechanism to fight against malignancies without causing harm to healthy cells. There are several different viruses which have undergone in vitro and in vivo trials to determine their therapeutic efficacy for oncolytic therapy. This study will be an extensive review of the oncolytic viruses which have successfully produced results and the process by which they were able to do so. Further research will be done to determine which viruses are the most effective in either their natural state or when genetically modified by more advanced technology. These two advancements, delivery and effectiveness, will change the landscape of the field of oncolytic viruses. Gaining a better understanding of the mechanisms of each individual virus and how it interacts with the body can help to further establish oncolytic viruses as the future of antitumor therapy.

**Abstract # A58**

**Type of presentation: Poster**

**Authors**: Thomas Rodriguez[1], Jonathan Clement[1], Shaumik Patil[1], and Eslam Mohamed[1]
[1] Master of Pharmaceutical Sciences, College of Graduate Studies, California Northstate University.

**Title:** Exploring the role of mitochondrial unfolded protein response (mt-UPR) in human macrophages under endoplasmic stress and tumor conditions

The immune system is well-equipped with different strategies to combat malignancy, but cancer cells have evolved to circumvent immune surveillance. The innate immune system dysfunction is one of the main aspects of cancer and tumor associated macrophages (TAMs) are considered the most abundant subsets of cells that contribute to tumor progression and immune suppression within the tumor milieu. Accumulating evidence has correlated the intrinsic Endoplasmic Reticulum (ER) stress in different myeloid cells with their pro-tumor phenotypes however, the downstream mechanisms by which ER stress promotes this phenomenon are not fully elucidated. In this project, we utilized THP-1 derived macrophages and explored the impact of exposing these cells to ER stress and tumor-associated factors on the mitochondrial unfolded protein response (mt-UPR) pathway. We hypothesize that induction of mt-UPR is essential for the survival and function of macrophages under these conditions. Our initial approach was to test the induction of mt-UPR genes through RT-PCR in macrophages undergoing ER stress or conditioned with tumor media. We found an upregulation of some mt-UPR targets, most notably the LONP1 gene, in both testing conditions. To confirm if the genetic upregulation of LONP1 is present at the protein level, we performed western blot. Our results show that ER stress and tumor factors increase the expression of LONP1 protein. Interestingly, we found that LONP1 is upregulated in THP-1 derived macrophages compared to their monocytic precursors suggesting a potential role for LONP1 in the differentiation program of macrophages. Collectively, we developed an in-vitro model by which we can study the crosstalk between the tumor environment and the mt-UPR program in human macrophages. Moving forward, we will perform genetic deletion of LONP1 in THP-1 cells and explore its contribution in promoting the immunosuppressive phenotype of macrophages under ER stress or tumor environment.

**Abstract # B53**

**Type of presentation: Poster**

**Authors**: Joshua Kim[1], and Hongbin Wang[1]
[1] Master of Pharmaceutical Sciences, College of Graduate Studies, California Northstate University.

**Title:** SARS-CoV-2 Vaccination and Its Clinical Complications

Originating from Wuhan markets in 2019, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a positive-sense, single-stranded RNA virus that has spawned multiple variants. In response to the rising transmissibility of the virus, various vaccines have been developed. The Pfizer-BioNTech and Moderna vaccines are mRNA-based and incorporate an mRNA lipid nanoparticle (LNP) comprising an ionizable lipid, cholesterol, a pegylated lipid, and distearoylphosphatidylcholine. The AstraZeneca and Johnson & Johnson vaccines utilize a modified adenovirus, in which the E1/E3 early genes responsible for replication have been deleted, thus reducing the immunogenicity of the vector. A commonality among these vaccines is that they target the spike protein, a type I glycoprotein that binds to the angiotensin-converting enzyme 2 (ACE2) receptor. As the viral information enters the cells, it undergoes a translational process that produces spike proteins, activating the immune system and releasing essential components, such as memory B cells, neutralizing antibodies, CD4+ T cells, and CD8+ T cells. Although these vaccines were developed to combat the infectious process, adverse effects have emerged. In this paper, we focus on the clinical complications associated with the SARS-CoV-2 vaccines, such as vaccine-induced immune thrombotic thrombocytopenia (VITT), a thrombotic thrombocytopenia syndrome characterized by the presence of anti-PF4 antibodies triggered by vaccination. By delving into the clinical complications, we seek to acquire a deeper level of understanding about the vaccines and how it holds the potential of triggering cases like molecular mimicry as observed in cardiac difficulties involving myocarditis. Moreover, the emergence of adverse events such as antibody-dependent enhancement and hemolytic syndrome highlights the need for further evidence to validate the benefits and risks associated with the vaccination process.

**Abstract # B54**

**Type of presentation: Poster**

**Authors**: Lawrence Santos[1], Christopher Lane[1], and Ahmed El-Shamy[1]
[1] Master of Pharmaceutical Sciences, College of Graduate Studies, California Northstate University.

**Title:** Screening the Anti-Hepatitis B Virus Activity of Biological Venom Library by High-Throughput Immunofluorescence Assay

As the most common cause of chronic liver failure disease worldwide, Hepatitis B Virus (HBV) infects approximately 1.5 million people annually. Despite the availability of the hepatitis B vaccine, which is estimated to prevent 38 million deaths between 2000 and 2030, HBV continues to contribute to an estimated 820,000 deaths each year. The study aimed to assess the anti-viral activity of biological venoms in hopes of developing new therapeutic drugs to treat HBV infection. A study was conducted across a high-throughput screening of 20 biological venoms on HBV-infected hepatocytes to determine the venom's potential anti-viral capacity. Biological venoms that show promising infection inhibition will be purified in future studies to determine their protein structure and mechanism of action. Each venom was assessed for cytotoxicity concentration (IC50) prior to infection using an ATP-based luciferase assay on a hepatic cell line, HepG2. As the sodium-taurocholate co-transporting polypeptide (NTCP) is the means of HBV cellular entry, HepG2 cells were genetically modified by over-expressing the NTCP receptor to increase the likelihood of infection prior to the application of the venoms. We referred to the over-expressed HepG2 cells as HepG2-AE cells. Infected HepG2-AE cells were detected by immunofluorescent staining of the HBV-core protein. The stained cells were visualized using a high-throughput imaging technique. Analysis of the antiviral activity of biological venoms was performed to determine the extent of infection inhibition with comparison to positive (HepG2-AE cells + virus only) and negative (HepG2-AE cells alone) controls. At the time of writing this abstract, the anti-HBV screening is currently ongoing. The results of this pilot study will yield improvements in both the knowledge of functional inhibition of HBV and hopefully the development of novel anti-HBV compounds.

**Abstract # B55**

**Type of presentation: Poster**

**Authors**: Tristan Motoyoshi[1], and Hongbin Wang[1]
[1] Master of Pharmaceutical Sciences, College of Graduate Studies, California Northstate University.

**Title:** The Role of Complement Components and Membrane Bound Complement Regulatory Proteins in Tumor Metastasis

The complement system is an important aspect of our immune system that protects our bodies from foreign pathogens. It is the key connection between innate and adaptive immunity. The complement system has three pathways that help combat and rid our bodies of these pathogens. Specifically, these pathways use complement components, C3a and C5a, and membrane bound complement regulatory proteins (mCRPs), such as CD46, CD55, and C59, to efficiently accomplish its various roles. It was previously believed that the three complement pathways also helped suppress and combat cancerous cells that appeared throughout our bodies. However, it is now better understood that the complement system can both act against and enhance tumor cell growth. The previously mentioned complement components and mCRPs have been identified to be active and present in different types of cancers and are shown to act against and enhance the tumor cells. Recent studies have identified potential therapeutic opportunities for cancer treatments that involve inhibition of complement components, C3a and C5a, as well as the prevention of the upregulation of mCRPs, which can help hinder tumor metastasis and immune evasion. An improved understanding of the relationship between complement components, mCRPs, and tumorigenesis and metastasis may be crucial in the development of efficient therapies and treatments for various cancers.

**Abstract # B56**

**Type of presentation: Poster**

**Authors**: Hanaa S. Khan[1], and Ahmed El-Shamy[1]
[1] Master of Pharmaceutical Sciences, College of Graduate Studies, California Northstate University.

**Title:** A Systematic Review on the Prevalence, Risk Factors, and High Impact of Long-COVID in Middle Aged Women

Recovering for COVID-19 requires patience and resilience however those diagnosed with Long-COVID are drastically different. The need for constant relief, treatment, and answers. The Center of Disease Control states that Long-COVID as “health problems that persist more than a month after a covid infection.” Symptoms of normal Long COVID, as stated by the National Health Services are extreme tiredness (fatigue), shortness of breath, loss of smell, muscle aches. However there is an varied amount of symptoms that can persist after, such as problems with your memory and concentration, chest pain or tightness, difficulty sleeping (insomnia), heart palpitations, dizziness, pins and needles, joint pain, depression and anxiety, tinnitus, earaches, feeling sick, diarrhea, stomach aches, loss of appetite, high temperature, cough, headaches, sore throat, changes to sense of smell or taste, rashes. These lingering symptoms can cause distress in daily life, making it a huge focus for health care providers and those suffering from long-COVID to know more about it. It was found that females are more likely to have symptoms for more than 4 weeks after recovery from acute COVID-19 disease. Conducting 17 literature reviews to uncover the differential effects that females have had persistent COVID-19 symptoms. Participants within each study were individuals who have had and recovered from COVID-19. To successfully estimate why females are at a higher risk for Long COVID-19 through Quality Prognosis Studies tool by performing odds ration (OR). 10 articles evaluated age, 2 articles evaluated sex, and 5 articles focused on risk factors of long COVID-19. This current review indicates that females were significantly more likely among females to have long COVID syndrome. While there is still a lot unknown about long-COVID, analyzing the prevalent research conducted in females can be a forward step in uncovering more about it’s connections to treatment and the future of this high-alert health emergency.

**Abstract # B57**

**Type of presentation: Poster**

**Authors**: Allison West[1], and Hongbin Wang[1]
[1] Master of Pharmaceutical Sciences, College of Graduate Studies, California Northstate University.

**Title:** The Connection between Systemic Lupus Erythematosus and the Complement System

Systemic Lupus Erythematosus (SLE) is a systemic multisystem autoimmune disease in which the underlying mechanism is still undetermined. As researchers continue to investigate the involvement of autoimmunity in SLE, it has become evident that the complement system plays an important role in both the development and progression of the disease. The complement system is categorized into three different pathways, which are the classical pathway, the lectin pathway, and the alternative pathway. The activation of the complement system is linked to the regulation of innate and adaptive immune responses, which were considered to play a crucial role in recognizing damaged host cells, sensing pathogens, and eliminating potential dangers. However, when the complement system becomes dysregulated or has unrestricted activation, tissue damage caused by complement dysfunction mediated inflammation occurs. Previous studies have demonstrated that deficiencies of C1q, C1s, C1r, C4, C2, and C3 are detrimental to SLE's development and prognosis. Abnormal activity of complement components such C5, MASP-1, MASP-2, MASP-3, Factor D, and Factor B also appear to influence the development and outcome of SLE. In addition, some studies showed that inhibition of the activities of some complement components can prevent SLE, pointing to the complement system's intricate connection to the disease. This may be key to uncovering pathological mechanisms and developing effective therapeutics for SLE. With so much mystery surrounding the development and treatment of many rheumatic diseases like SLE, research into the complement system's role in disease development can have groundbreaking effects in the field of immunology and in the lives of people living with SLE.

**Abstract # B58**

**Type of presentation: Poster**

**Authors**: Troy Smith-Bova[1], and Hongbin Wang[1]
[1] Master of Pharmaceutical Sciences, College of Graduate Studies (MPS), California Northstate University.

**Title:** Cancer vaccines: past, present, and new approaches for immunotherapeutics

For decades the field of therapeutic cancer vaccines has struggled with translating cancer research into effective clinical therapies, but thanks to advances in research and some clinical success, there is resurgent interest in this approach. Presently, the FDA has only approved two prophylactic vaccines, one for a hepatitis B virus linked to liver cancer and another for human papillomavirus accounting for around 70% of cervical cancers. Similarly, the first approval of a therapeutic cancer vaccine has only recently come in the form of Sipuleucel-T, an immune cell-based vaccine, for the treatment of hormone-refractory prostate cancer. The goal of therapeutic cancer vaccines is to induce tumor regression, eradicate residual disease and establish lasting antitumor memory. However, tumor-induced immunosuppression and immunoresistance pose significant challenges to achieving these goals. The delivery mode of antigen-based vaccines is a major determinant of a vaccine's success, antigens may be delivered directly in the form of peptide, mRNA or DNA vaccines or loaded on DCs ex vivo. Overcoming mechanisms of tumor resistance is being innovated by administering a combination of different vaccine platforms, concurrent immunomodulation and with support from traditional cancer therapies, such as radiation and chemotherapy. The timing, sequence and dosing of each component need to be carefully determined and tailored to the array of pathologies and patients, to improve treatment outcomes. This paper discusses past success and failure in cancer vaccine clinical development, explores different vaccine platforms and details how continued research and further development of antigen delivery methods together with new advances in science are facilitating improved vaccine designs. This review's purpose is to examine cancer vaccines of diverse platforms and targets and discuss the newest approaches to optimizing their clinical efficacy.

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