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**CENTRAL
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TABLE *OF* CONTENTS

I.	<i>Oral Presentation Abstracts.....</i>	1
II.	<i>Poster Presentation Abstracts.....</i>	40
III.	<i>Judges, Moderators, and Committee Members</i>	143
IV.	<i>Sponsoring Institutions</i>	146

**ORAL
PRESENTATION
ABSTRACTS**

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Chemistry

Synthesis Of A JJ-450 Analog Towards AR-Based PROTACs

Androgen Receptor (AR) signaling is crucial for normal prostate development, but also fuels the growth of prostate cancer cells. Current treatments to target AR signaling includes inhibiting AR function through antagonists such as enzalutamide and bicalutamide, by targeting the ligand binding domain of AR. However, due to mutation and AR splice variants lacking the ligand-binding domain, resistance still occurs. To combat the increase in resistance to current treatments, the small molecule JJ-450 has been found to bind to the N-terminal domain (NTD) of AR and inhibit variants and mutations lacking the ligand-binding domain (LBD). Proteolysis targeting chimera (PROTACS) emerges as a new drug discovery technology showing better efficiency than protein antagonists. PROTACs are bifunctional molecules that consist of three chemical elements: a ligand binding to a protein of interest (POI), ligand binding to E3 ubiquitin ligase, and a linker for conjugating the two ligands. Upon binding to the POI, the PROTAC can recruit E3 ligase for POI ubiquitination, which is subjected to degradation by the proteasome. We aim to develop a JJ-450 based PROTAC, currently we are synthesizing a JJ-450 analog starting from 5-Bromo-2-fluoronitrobenzene. We have completed a three-step transformation by introducing a triple bond via a Sonogashira coupling reaction and incorporating an amide bond. Once synthesized, the JJ-450 analog will be appended to an E3 ligase via a PEG linker to create a PROTAC. The compounds will be characterized by ^1H , ^{13}C NMR spectroscopy, IR, and HRMS. The IC_{50} values of the PROTAC will be determined using a cell proliferation bioassay assay. Western Blot will then be used to evaluate the ability of the PROTAC to degrade AR.

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The Role of Constitutive and Genetic Innate Immunity on Salmonella in Wild Finches

A recent outbreak of *Salmonella enterica* serovar Typhimurium in 2020-21 resulted in a large die-off of wild cardueline finches in the Pacific Northwest and California. Studies predominantly focus on the presence of *Salmonella* in humans and agricultural animals, but studies on the relationship between this pathogen and wild songbirds are lacking. Cardueline finches occupy bird feeders, however pine siskins (*Spinus pinus*) seem to die during *Salmonella* outbreaks whereas other finch species, such as lesser goldfinches (*Spinus psaltria*) and house finches (*Haemorrhous mexicanus*) appear resistant. The aims of this project are to (1) quantify constitutive innate immune function by measuring bactericidal activity in three local wild finch species (pine siskins, house finches, and lesser goldfinches) against a locally cultured avian *Salmonella* strain in vitro, and (2) analyze genetic variation at Toll-like receptor 4 (TLR4), which is involved in immunity against this bacterium. We found that there was significant variation in their constitutive innate immunity against *Salmonella* through an ANOVA ($F_{2,119} = 263.4$, p-value: $P < 0.0001$), with pine siskins and lesser goldfinches having low bactericidal ability in comparison to house finches. TLR4 analysis is underway. By comparing the results of both the BKAs and TLR4 variation, we will get a better understanding as to why certain cardueline finches may be more susceptible to *Salmonella* infections. Overall, this research will provide data that helps with the conservation of local bird populations that are susceptible to bacterial infections and help with mitigating avian zoonotic diseases.

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Criminology: Forensic Behavioral Science

Sexual Assault Prevention on College Campuses: A Comparison of Policies in California Institutions of Higher Education

Sexual victimization is a serious issue that is pervasive among institutions of higher education. However, it has been over five years since the last systematic review of institutions' approaches to preventing campus sexual assault (Richards, 2019). Since then, several events have impacted how institutions respond to sexual misconduct, including the #MeToo Movement and the COVID-19 pandemic. To address this gap in the literature, we conceptually replicated Richard's (2019) methodology in a comprehensive review of all California four-year public and private-nonprofit higher education institutions that received Title IV funding, including the 23 California State University campuses and the nine University of California campuses. Specifically, we investigated Title IX and the Clery Act compliance for each institutions' website, annual security reports, and student-orientated resources. A comparison of our review and Richard's (2019) review shows that public and private-nonprofit California institutions increased their compliance with amnesty policies (37% in 2019; 63% in 2023). By contrast, private-nonprofit institutions reduced availability of on-campus counseling (95% in 2019; 60% in 2023). Public and private-nonprofit California institutions reduced availability of survivor advocates (68% in 2019; 35% in 2023) and public procedures for victims to follow if a sexual assault occurs (91% in 2019; 67% in 2023). These findings suggest that, while overall compliance with Title IX policies has improved since 2019, the availability of key on-campus and online resources for victims has declined. We discuss the potential roles of campus closures in creating these changes in the availability of Title IX resources and make recommendations for bridging policy gaps within the California State University system.

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History

Hombres Honrados: Modernity and Masculinity in La Banda del Carro Rojo

During the latter half of the twentieth century the Mexican middle class struggled with their class identity, reevaluated their relationship with the government, adopted new political ideologies, and redefined gender roles. As the country modernized and whilst these changes occurred within the middle class, Mexico's rural poor sought to retain and maintain familiar customs and cultures that aligned with their preexisting patriarchal structures. What emerged from Mexico's rural poor was a version of machismo (aggressive masculinity) that solidified their power as men and enabled men from different social strata to retain their masculinity in times of uncertainty and change. In this study, I analyze the 1976 Mexican film *La Banda del Carro Rojo* to highlight that the film provides audiences with a unique and alternative look into the daily lives and struggles of Mexican men fighting to retain their masculinity. By analyzing the four main characters in this film, I argue that ideas and values of masculinity evolved in Mexican society and that the film is a critique and response to the changing society of the 1970s. By also analyzing the dialogue, plots, fashion, and corridos (Mexican ballads) featured in this film, my research highlights that Mexico's rural poor were fully aware of, affected by, and actively involved in the rapid changes taking place in Mexican society between 1970 and 2000. Furthermore, my research reveals how Mexican men – regardless of their position in society – used narco cinema as an outlet to maintain patriarchal structures and retain the masculinity they held before the globalization and modernization of Mexico.

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Effect of Glycosylation and Tandem Repeats on the Binding Affinity of MUC1 Binding Antibodies

In recent years, the use of antibodies as potential cancer therapeutics has been a growing area of research due to their specificity. One possible target being researched is MUC1, a mucin protein found in epithelial cells, which has been associated with adenocarcinoma. In cancer cells, MUC1 undergoes changes that differentiate it from noncancerous cells, including overexpression, loss of cell polarity, and truncated glycosylation of the protein. This study aimed to determine if changes in glycosylation and the presence of a tandem repeat of MUC1 would affect an antibody's binding affinity to the mucin protein. The effect of glycosylation was analyzed by comparing the antibody binding affinity of a glycosylated MUC1 peptide fragment to a non-glycosylated MUC1 20 MER peptide. The impact of a tandem repeat was investigated by comparing two GST-fused MUC1 copies: a MUC1 sequence and a 5-tandem repeat sequence. The binding affinities of five antibodies (AR20.5, C595, H16K6, Panko mAB, and 4H5) were analyzed using two types of binding assays, SPR and ELISAs. A paired t-test was performed to determine the significant difference in affinity. Analysis of SPR results suggested there was no statistically significant difference in the binding affinities for most of the antibodies analyzed, however, AR20.5 had a statistically significant difference in binding affinities for both the glycosylation and tandem repeat comparisons performed. ELISA results for the affinity of AR20.5 were consistent with those from the SPR analysis. These preliminary results suggest most of the antibodies tested, aside from AR20.5, showed no notable difference or effect on the binding affinity to MUC1 as a result of changes to glycosylation or the presence of tandem repeats. Since AR20.5 results suggest, there is an effect on affinity, future work involves further experimentation and analysis of this antibody.

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Spatial Ecology of the Little Panoche Valley Blunt-nosed Leopard Lizard (*Gambelia sila*) Population

The Blunt-nosed Leopard Lizard (*Gambelia sila*) is a state and federal endangered species in part due to the decline of suitable habitat throughout the San Joaquin Valley of California. The San Joaquin Desert has become increasingly fragmented over time due to human expansion and agriculture, forcing Blunt-nosed Leopard Lizard populations into isolated areas with diminishing or unsuitable resources. Efforts are being made to preserve the remaining extant populations and bolster dwindling populations through management and captive breeding, however it is crucial to ensure these resources are being used effectively and progress is being made. To understand how their spatial ecology affects their success on the landscape, we used radio telemetry to track lizards over a three-year period from 2020 to 2023 during the main portion of their active season from May to August. We tracked 21 individual adult leopard lizards in 2022, 6 lizards in 2021, and 11 lizards in 2020 to determine home range size and land use. Additionally, to create a fine-scale ecological niche model to determine habitat suitability and preferences we collected soil samples, operative temperature estimates, rodent burrow density, percent open space, and landscape data across the Little Panoche Valley region. Understanding how these factors contribute to blunt-nosed leopard lizard population dynamics inform ongoing recovery efforts, including Panoche Plateau repatriation.

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Criminology

The Housing Needs and Experiences of Project Rebound Students at Fresno State

Students and formerly incarcerated people are both at-risk populations for housing insecurity and homelessness. Therefore, formerly incarcerated students are members of two at-risk populations. This study provides a better understanding of the housing needs of formerly incarcerated students, specifically the housing needs and experiences of students in Fresno State's Project Rebound, a support program for formerly incarcerated students. In Crutchfield and Maguire's (2018) study, CSU students shared how homelessness influenced their lives, including struggling with their academics and negative impacts on their health. This study explores the needs and experiences of Project Rebound students through their own accounts. Qualitative semi-structured interviews were conducted with a diverse sample of 15 Project Rebound students currently enrolled at Fresno State. The data was analyzed based on a modified grounded theory approach.

The research findings highlight the struggles Project Rebound students face in terms of housing, including but not limited to increasing costs, long commutes, and challenges with the location of their housing. The findings provide insight into the complexity of issues related to housing insecurity, including what factors contribute to it, what factors have a positive influence, and how circumstances can fluctuate over time. Significantly, this study reports on the research participants' own suggestions for areas of improvement in supporting people who experience issues with their housing, particularly in regard to make existing offers for housing assistance more inclusive.

Through providing a clearer understanding of the housing needs and experiences of Project Rebound students, this study is positioned to not only inform Fresno State's new housing initiative for Project Rebound students, but also other Project Rebound programs in the CSU, or other educational programs that support formerly incarcerated people nationwide. Furthermore, the results of this study add to the scarce research literature on the experiences and needs of formerly incarcerated students.

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Women, Gender and Sexuality Studies

Caring for women at The Well Community Church, the patriarchal structure forcing women out.

Patriarchy systematically lives in all aspects of American life. In Fresno California, the most blatant displays of patriarchy and how abusive it is to women, is shown in how conservative evangelical churches address women. This study shares experiences with women who have left or have never fully felt included at The Well Community Church in Fresno California. The Well is a multi-site, conservative non-denominational church, who professes to “helping people connect to God and to each other in every neighborhood.” This project was an ethnographic study of three women, two who had attended and left The Well Community Church and one that still attends but does not identify as a member of the church. These women shared their stories of time participating in the church and what ultimately led them to leave, or to not feel a part of the church body. From these interviews we find that the connection is varied, minimal at best, and exclusionary at worst. While The Well Community Church is only one example of how conservative evangelical churches devalue women while demanding submission of women to men, in the church and the home, we can imagine how expansive this ideology is not just in Fresno, but across the United States. We need to further investigate how these churches treat women and deny them care and connection with both pastors and one another, so we can change the structural dynamic of how they are built and start to hold the men in power positions responsible for the care of women within the church settings.

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Climate events affecting the larval distribution of the invasive Chinese mitten crab, *Eriocheir sinensis*, in the San Francisco Bay Delta

The Chinese Mitten Crab (CMC), *Eriocheir sinensis*, invaded the San Francisco Bay Delta system in 1992, due to human introduction. Since the establishment of this invasive species, there have been many negative environmental and economic impacts surrounding the San Francisco Bay. Explosions in adult populations can potentially have negative effects on native species through competition and predation. Other effects of the mitten crab are caused by juveniles that include stream bank and levee erosion through burrowing behavior that could potentially destroy future housing developments and erode natural ecosystems. Monthly plankton tows taken from the California Department of Fish and Wildlife (CDFW) station D41 were analyzed for *E. sinensis* zoeae. Brachyuran zoeae and megalopa were keyed to species with the use of a dichotomous key (Rice and Tsukimura, 2007; Gonzales et al, 2009). In April 2003, was the highest number of mitten crab zoeae where they recorded a total of 407 larva samples (CPUE = 4064.5). In 2005, no adult crabs were found in Otter trawls conducted by the CDFW and by 2008, no mitten crab zoeae were found in plankton tow surveys. However, in 2012 a total of 26 mitten crab megalopa were discovered and in 2013, another 9 mitten crab megalopa were found. Temperatures below 11.8°C and salinities below 15 psu are associated with declines in CMC abundances. Strong La Niña intensities are associated with increased abundances of CMC. If population explosions can be predicted, preparations can be made for the negative effects caused by the downstream migration of mitten crab juveniles. We are continuing to sort and identify crab zoeae for the years of 2014 and on to keep a record for all the invasive crab species in San Francisco.

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Biology

Migratory strategy and bloodborne parasite prevalence and diversity in overwintering dark-eyed juncos

Parasitism is a predominant and widespread biological interaction that can have detrimental effects on their hosts, ranging from reduced fitness to mortality. Teasing apart host-parasite interactions is crucial to understanding host behavioral strategies, like migration, and host-parasite coevolution. Several non-mutually exclusive hypotheses attempt to predict whether parasite prevalence and overall diversity are associated with a migratory or sedentary strategy. However, studies comparing the effects of migratory and sedentary behavior on parasite-host dynamics within a single species are limited since many species adopt only one strategy. The Appalachian Mountains are home to two seasonally sympatric subspecies of dark-eyed juncos, the migratory northern slate-colored junco (*Junco hyemalis hyemalis*) and the resident Carolina slate-colored junco (*J. h. carolinensis*). This system provides a unique opportunity to study the relationship between migratory behavior and parasite infectivity. We hypothesize that the migratory juncos will have a higher prevalence of haemosporidia, or bloodborne, parasitic infections due to annual cyclical variation in habitat and subsequent exposure to different flora and fauna. Avian blood samples were collected in the spring of 2018. We used nested PCR to simultaneously detect the presence of the three common haemosporidian genera (*Plasmodium*, *Haemoproteus*, and *Leucocytozoon*) by amplifying a fragment of their cytochrome b gene. Fragments were sequenced and compared to the National Center for Biotechnology Information (NCBI) and MalAvi databases to identify unique parasite lineages. We also estimated individual parasite load using relative quantitative PCR. We found no difference in overall parasite prevalence and load between the two subspecies. However, the migratory juncos had a higher prevalence of *Leucocytozoon* infections and were parasitized by a greater diversity of *Plasmodium* lineages than the resident subspecies. These results provide insight into the relationship between parasitic infections and host migratory behavior and can ultimately help us explore the evolution of host immunity in relation to migration.

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Viticulture and Enology

Herbicide Resistance Prevalence in San Joaquin Valley Populations of Palmer Amaranth

Palmer amaranth (*Amaranthus palmeri*), a summer annual weed, is ranked as one of the worst weeds in US agriculture. This species is known for its diverse genetics resulting in resistance to different herbicides including glyphosate (RoundUp®). Palmer amaranth populations that are glyphosate-resistant have spread from the Midwest to California. However, the extent of the spread of resistant populations is not known. Glyphosate and rimsulfuron are common herbicides used for perennial systems in California. In order to understand the extent of the spread, a 2022 study was conducted in a greenhouse in Fresno, CA to assess San Joaquin Valley populations of Palmer amaranth for resistance to glyphosate and rimsulfuron. Approximately three hundred seeds from eight populations were stratified. The seeds were germinated on July 1, 2022 and transplanted approximately a week later in potting mix (#3 Sunshine). A total of sixteen plants from each suspected resistant population were treated with each herbicide. As the plants reached 3-6 leaf stage, they were treated with 0, 1, 2, and 4x field rate for both herbicides, where $x = 48$ fl oz/ac for glyphosate (Roundup Powermax®) and 4 oz/ac for rimsulfuron (Matrix®). The herbicides were applied with a CO2 backpack sprayer at a volume of 40 and 20 gal/ac for glyphosate and rimsulfuron. Plants were monitored for 28 days after treatment and mortality data was recorded. The experimental design was a split plot with main plots of herbicide rate and sub- plot of population. Some Glenn County population plants survived higher field rates for both herbicides, making them resistant. Some populations were either entirely susceptible or showed resistance to rimsulfuron alone (four populations). Therefore, this showed that herbicide resistant Palmer amaranth is increasing in prevalence.

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Chemistry and Biochemistry

Progress Toward the Biomimetic Synthesis of Tetracyclic Bis-Piperidine Alkaloid Derivatives as Potential Lead Anticancer Agents

Natural products have a long-standing history of use in traditional medicine, and in recent decades, they have gained traction in the pharmaceutical industry as the inspiration for novel therapeutic drugs to treat various diseases. However, traditional approaches to synthetic chemistry, which often utilize environmentally-toxic reagents, tend to be wasteful in an age where identifying eco-friendly solutions to replace well-established practices is of the utmost priority. Biomimetic synthesis is a green chemistry practice that draws inspiration from the biological processes that drive the synthesis of chemical species that comprise an organism. Consequently, this method of synthesis could provide an answer to an industry searching for ways to reduce its negative environmental impact while simultaneously looking toward nature and its naturally-occurring chemical framework for leads in treating disease. Our research group has made steady and ongoing progress toward synthesizing derivatives of tetracyclic bis-piperidine alkaloids through biomimetic processes in order to improve or retain their natural antiproliferative efficacy against breast cancer, leukemia, and melanoma cell lines.

A commercially available starting material, 2-methylbut-3-yn-2-ol, underwent esterification with acetic anhydride, followed by a substitution reaction with benzylamine and another subsequent substitution reaction with methyl propiolate to generate a crucial intermediate toward a 1,6-dihydropyridine precursor containing a geminal disubstitution. This intermediate was then subjected to a cyclization reaction involving a water-soluble organocopper catalyst to generate what is believed to be the geminally disubstituted 1,6-dihydropyridine precursor (pending characterization using ¹H-NMR, ¹³C-NMR, and IR spectroscopy). Several Boc-protected linkers of various lengths have also been generated for future procedures that have been planned to achieve the synthesis of an amide precursor toward the total synthesis of tetracyclic bis-piperidine alkaloid scaffolds containing pharmacophores at strategic sites to optimize anticancer potency, chemical stability, and bioavailability. These could potentially serve as promising lead structures to combat various cancers.

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Growth of juvenile Chinook salmon and transition from yolk to environmental carbon and nitrogen from prey sources

San Joaquin River Restoration Program (SJRRP) was started in 2006 to create water flows that can restore a naturally reproducing and self-sustaining population of Chinook salmon. The Blumenshine lab collaborates with the SJRRP and plays an important part in salmon restoration by studying the interactions between juvenile Chinook and their environment, including trophic (feeding) interactions. Carbon ($\delta^{13}\text{C}$) and nitrogen ($\delta^{15}\text{N}$) stable isotope analyses (SIA) are widely used in aquatic ecology to understand the trophic interactions of fish because the stable isotope signatures of fish closely resemble that of their prey. We processed juvenile Chinook salmon samples from the San Joaquin River over three years from 2019-2022 as well as samples from a control group; hatchery-raised Kokanee trout that were fed on a consistent hatchery diet for SIA. We dissected, dried, encapsulated, and shipped dorsal muscle tissue samples to the UC Davis Stable Isotope Facility for dual $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ SIA. Analysis of the river Chinook stable isotope data showed abnormally high $\delta^{15}\text{N}$ values for smaller and recently hatched fish that decreased quickly as the size of the fish increased and then remained fairly flat, thus showing an apparent relationship between fish size and $\delta^{15}\text{N}$ values. We hypothesize that the high $\delta^{15}\text{N}$ values in recently hatched Chinook can be attributed to the distinct stable isotope signature of yolk derived from the maternal sources. However, the stable isotope data from hatchery-fed Kokanee showed no relationship between $\delta^{15}\text{N}$ and size probably because the maternal tissue was also derived from the same diet. We will use the results from this study to inform our selection of viable individuals for studying trophic interactions in the future.

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Encapsulation of gold nanoparticles into protein cages through genetically modified viral proteins

Protein cages such as virus-like particles (VLPs), are composed of a distinct number of subunits to form cage-like structures with an inner cavity, making them an attractive platform for encapsulating guest cargos including inorganic nanoparticles. Combining a protein cage with inorganic material allows the container-cargo unit to take on unique physicochemical properties. Here we utilize VLPs derived from bacteriophage P22 as a platform to encapsulate gold nanoparticles (AuNPs). P22 VLP is a 60 nm diameter protein cage with an inner cavity diameter of 50 nm constructed from 420 copies of coat protein (CP) and roughly 100–300 copies of scaffolding protein (SP). P22 VLPs can be formed by mixing individual CP and SP monomers in vitro or by co-expressing them in *E. coli*. We hypothesized that if SPs can associate with AuNPs, CPs will self-assemble to encapsulate the AuNPs. Naturally, wild-type SP do not interact with AuNPs. Thus, we have genetically introduced a peptide motif to the SP, which shows high affinity with AuNPs. We have shown that the engineered SP are capable of mediating assembly of CP into VLPs comparable to wild-type SP through in vitro assembly. The overall morphology and hydrodynamic radii (R_h) of the VLPs post-in vitro assembly were analyzed. The VLPs with the engineered SP as well as VLPs with the wild-type SP showed spherical morphology with R_h of 30 nm, consistent with the expected structure of P22 VLPs. Encapsulating AuNPs using the engineered SP is our next step. An initial study using 23 nm diameter AuNPs stabilized with cetyltrimethylammonium chloride (CTAC), a capping ligand, resulted in AuNP aggregation during the assembly process, presumably due to the high salt concentration necessary for assembly. We are investigating replacement of CTAC with a ligand which is expected to impart better stability to AuNPs under a high salt concentration.

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Young Makers and Future Teachers in the Making: Fresno State's Mobile Making Program for Underserved Communities

This study explores the creation and impact of Fresno State's afterschool program, Mobile Making, which seeks to broaden participation for youth in Science, Technology, Engineering, and Mathematics (STEM). The Mobile Making program prepares and places undergraduate students enrolled in Service-Learning courses at Fresno State in local elementary schools within Fresno Unified School District (FUSD) to facilitate hands-on activities that allow children to apply STEM knowledge and skills to design and make (NSF-AISL, Award 2215656). Currently, the diversity of the STEM workforce is still unrepresentative of the larger United States population. Further, research shows that an early interest in STEM is crucial for persisting and pursuing a STEM career. This program provides early STEM experiences to FUSD children and opportunities for undergraduate students to experience teaching and give back to their community. In this study, we investigated (1) the impact of the Mobile Making program on children's interest in making and STEM, and (2) the impact of facilitating STEM activities on university students' interest in teaching STEM. Using a mixed-methods research design, we analyzed surveys from both undergraduate students and the participating children, as well as qualitatively analyzed undergraduate field notes and artifacts created by children. Results indicate that the Mobile Making program increased children's interest in making and STEM. Moreover, university students' interest in teaching also increased. Recommendations and implications for this work are shared to advance equitable STEM education within the Central Valley of California.

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Animal Science

Time investment of platform enrichments used in a commercial broiler house

Environmental enrichments, such as platforms, are known to increase the complexity of a meat-type broiler chicken's environment within a commercial poultry house. Complexity promotes the occurrence of naturally occurring behaviors, and can be associated with broiler wellbeing. While utilization of platform enrichments appears to be an easily accomplished task, many factors in implementation, cost, and training are overlooked. A standard commercial sized broiler house would utilize 24-40 platforms to enrich the bird's environment. Incorporating this number of platforms comes at an expense of construction materials and management protocols. In addition to the noted increased costs associated with these platforms, we hypothesize that there will be a time investment increase when managing the house on a daily basis when enrichments are present. In this study, we timed the duration of daily walk throughs of an ~70ft length of house with and without the inclusion of three platform enrichments. Timed walks were measured twice daily for 42 days over three flocks. Seconds to complete walk throughs in control and platform areas were averaged by week and compared with a Student's t-test in JMP v.16. For each week in the growout process, the mean time to traverse the platform area was higher than that of the control area, although only week 1 was significant (33.6 ± 1.26 vs 41 ± 2.93 ; $P = 0.02$). Overall data indicates that the time to walk through the platform area took 4.33 minutes more than the control area. This information is useful in determining best practices and considerations to make when moving forward with integrating platforms into broiler houses.

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Chemistry

Using Computational Chemistry to Study the Photodegradation Mechanisms of Imidacloprid

The degradation mechanism of a neonicotinoid insecticide, imidacloprid, was studied using computational quantum chemistry. Imidacloprid is widely used in agriculture and can find its way into ground and surface water after use. Thus better knowing its degradation process can help with purification of water in the Central Valley. The research methods include use of Q-Chem to look at imidacloprid's geometry, excited states, forces etc. Some of the computations done on this molecule include: looking at the effect of implicit solvation on the molecular geometry and the excitation energies, and looking at energy barriers for breaking various bonds in the molecule. Ground state geometry optimizations revealed that the lowest energy conformation has a twist around the two ring structures. The N-N bond and C-Cl bond in imidacloprid was found to be very likely to break after excitation resulting in degradation. The accuracy of calculations is affected by methodology used. For imidacloprid excitations, it was found that Density Functional Theory (DFT) worked best when the specific form of the functional known as CAM-B3LYP (Coulomb-attenuating method for B3LYP) was used. Therefore, careful selection of methods is crucial to get the desired and reliable results. In conclusion, to learn the degradation mechanism of imidacloprid, data on its ground state geometry, excited states, bond breaking was collected which has shown a lot about this molecule's degradation. Further computational work on this molecule will reveal more about its properties and add to our understanding of its degradation mechanism.

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Mathematics

Heart Failure Prediction using Machine Learning Techniques

Heart failure is one of the leading causes of deaths worldwide. In the US, nearly 8.5% total deaths and 36% all cardiovascular disease deaths are due to heart failure. About 6.5 million people in the US over the age 20 have heart failure issues. Therefore, it is important to study the main causes leading to this problem, so that we can reduce the number of deaths caused by heart failure. We chose to solve this problem by studying heart failure data using machine learning techniques as the application of machine learning in the field of medical diagnosis is gradually increasing. This can be attributed primarily to the improvement in the classification and recognition systems used in disease diagnosis which is able to provide data that aids medical experts in early detection of fatal diseases thereby, increasing the survival rate of patients significantly. So, we chose a publicly available dataset that has 13 clinical features (age, high BP, ejection fraction, diabetes, smoking, follow-up time with doctor etc.). Then we utilize these 13 features to predict heart failure in a patient using machine learning techniques. In this study, we compare the predictive accuracy of different machine learning methods (logistic model, decision tree, lasso, ridge regression). The lasso method is able to predict 82% of the data correctly which is more accurate than other methods. Finally, we use subset selection methods (backward elimination, forward elimination) to describe the most important indicators out of those 13 features. We conclude that ejection fraction, age, follow-up time and serum creatinine are the most important factors in the prediction of heart failure.

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Biology

American robins show a heterozygote disadvantage at MHC class I when infected with West Nile Virus.

American robins (*Turdus migratorius*) are a reservoir host for West Nile Virus (WNV). As a reservoir host, they serve as an intermediate carrier of this pathogen. Collaborators at the avian ecoimmunology lab at Michigan State University infected juvenile robins, naive to WNV, to see the effect of food availability on infection intensity. Although nutrition had an effect on overall viremia in these birds, there was a noticeable variation in WNV titer levels within treatment groups, which may be explained by underlying genetic effects. A candidate gene to study potential genetic effects on WNV resistance is the major histocompatibility complex (MHC) class I, which recognizes and presents viral antigens to killer T cells. We hypothesized that the American robins would experience a heterozygote advantage at MHC class I, whereby those with the greatest diversity of MHC class I alleles would have the lowest levels of WNV titers. We performed polymerase chain reaction (PCR) to amplify MHC class I exon 3 and characterized alleles using high-throughput sequencing. We found that the American robins had [insert mean +/- SEM allele count] alleles at MHC class I exon 3, which encodes the hypervariable antigen binding site of the MHC molecule. Contrary to our hypothesis, we found a heterozygote disadvantage at this gene family, whereby the birds with high MHC class I allelic diversity had the highest WNV titer levels. Recent research suggests high MHC diversity in vertebrate animals can lead to T cell repertoire depletion, leaving the animals with maximal MHC diversity susceptible to infection. Overall, our study will expand the field avian immunogenetics by presenting unique results that contrasts the traditional theory of pathogen-mediated heterozygote advantage at immune genes.

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Mechanical Engineering

Thermal Therapy Treatment for Tremors

The purpose of this research is to investigate and expand upon the relationship between thermal therapy applications and alternative tremor treatments. Thermal therapy is typically used as a treatment for sore muscles and numbing procedures due to its effect on the muscles and nerves. Previous research on thermal therapy treatments for tremors has resulted in a positive correlation between cold temperature applications and reduced tremor symptoms. Specifically, thermal therapy applications ranging between 10 to 15°C applied for approximately 15 minutes to the extensor and flexor muscles of the forearm produced significant reductions in tremor amplitude for upper extremities. One of the concerns of applying cold temperatures, particularly extreme cold temperatures, is the potential damage to the nerves underneath the superficial skin layer. Additional research into the thermal transmission characteristics of human skin outlined a greater amount of cold thermoreceptors located further in the deep tissues relative to the smaller amount of hot thermoreceptors closer to the superficial layer. Current medical devices for thermal therapy treatments either apply mainly to small surface areas or employ the use of working fluids. While working fluids, such as air or water, can apply constant temperature to a surface, there is potential for leakage onto the patient that could result in injury. Thermoelectric temperature applications are more commonly used for recent medical devices to prevent this damage to the user. Additionally most patients, particularly tremor patients, would benefit from a larger temperature application surface to target more muscles and nerves. Current research steps include the design and prototyping of a device that uses thermoelectric components to evenly heat or cool the forearm of the patient for general thermal therapy treatments. Further applications of the device would be specifically for tremor patients, with potential changes to the design to account for the tremor patient demographic.

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Animal Sciences & Agriculture Education

An Examination of University Students' Knowledge and Perceptions of Agriculture.

This study sought to understand if consumers' knowledge of agriculture has an underlying relationship with their perception of agriculture. The prevailing assumption of previous studies is that individuals who complete an agricultural course tend to have a positive perception of agriculture. Previous research has focused on social perceptions of agriculture and used those results as the basis to establish refined educational resources to address those areas. However, previous research has yet to compare individuals' agricultural knowledge and their perceptions to determine if there is a relationship between these variables. The population for the study consisted of all freshmen attending California State University, Fresno during the fall 2022 semester (N = 4195). Students were categorized by their major and split into two groups, Agriculture or Non-Agriculture majors. An online questionnaire was administered to the population consisting of 20 agricultural knowledge questions and 20 perceptions of agriculture items, both of which were based on existing instruments that were found to be valid and reliable. Usable responses were received from 637 students, resulting in a response rate of 15%. The researchers examined the data to determine if there was a relationship between respondents' overall agricultural knowledge score and their perception of agriculture score using Pearson's correlation coefficient. In doing so, there was no significant correlation found between the respondents' agricultural knowledge and their perceptions scores. However, utilizing independent samples t-tests with a 95% confidence interval, the researchers did find that Agriculture majors indicated a more positive perception of agriculture (M = 3.47, SD = .38) as compared to Non-Agricultural majors, which had an overall neutral perception of agriculture (M = 3.04, SD = .28). As for agricultural knowledge scores, as expected, Agricultural majors had a higher mean score (M = 15.16, SD = 2.44) than their Non-Agricultural counterparts (M = 13.26, SD = 2.14).

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Thermal Behavior And Tolerance In Two Clades Of Southern Alligator Lizard

Molecular genetic techniques are frequently employed in the exploration of phylogenetic relationships and the identification of cryptic species. However, these tools are inadequate for the elucidation of ecological differences between species. In order to catalogue biodiversity and generate informed management plans, it is necessary to accurately predict the effects of environmental perturbations on various taxa. The Southern Alligator Lizard (*Elgaria multicarinata*) exhibits genetic and morphological diversity indicative of at least two species-level clades, which can only be distinguished through molecular analysis. The present study aimed to determine whether there were differences in the thermal behavior or thermal tolerance of these two clades, based on their latitude distribution. Results indicated that the two incipient species were largely ecologically indistinguishable, with minor differences in thermal behavior and tolerance. It was observed that selected body temperatures were lower in lizards of larger mass, and there was a trend towards lower temperatures being selected by the Southern clade. The subtle nuances of thermal behavior between subspecies may prove crucial for the conservation of these species in the context of ongoing climate change.

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Educational Leadership

Familismo Through Onboarding: Connecting Community College Alumni with Transfer Students

Introduction

Latin@/x students are underrepresented in universities (Postsecondary National Policy Institute, 2021). Seeking to improve community college (CC) transfer practices, this study explored experiences of Latin@/x individuals who transferred, then became the first in their family to complete a baccalaureate. Meta-analysis revealed three major findings reflecting familismo: 1) to navigate the university environment, transfer students sought onboarding guidance from those who transferred from the same CC; 2) they wanted to provide onboarding support for future transfers; 3) they wanted to return to their CC to share their knowledge.

Methods

This social constructivist, qualitative study gathered participants' insights through pláticas, "informal conversations" deeply rooted in feminist Chicana practices (Fierros & Delgado Bernal, 2016, p. 117). Stratified purposeful sampling approach identified 12 participants who attended the same CC and went to various 4-year universities. Accuracy was ensured through member checks.

Summary

According to Gonzales (2019), familismo is a Latin@/x value passed down between generations; it is characterized by a sense of responsibility towards family and an emphasis on collective over individual. It can lead to positive learning outcomes, a sense of belonging, and resilience for Latin@/x students (Gonzales, 2019). This study's findings reflected what Gonzales called a "cultural display" (Gonzales, 2019, p. 940) which helps students navigate predominately white spaces of academia.

Conclusion

First-generation college students are more likely to drop out in their first year (Ishitani, 2003), often feel lost and alone (López-Jiménez, 2022), and feel insecure about their academic potential (Pratt et al., 2017). Higher education institutions can help Latin@/x students combat this by cultivating familismo. Beyond creating alumni networks, CCs can connect outgoing transfers to previous transfers at their respective universities where they can receive mentoring. Universities, meanwhile, can facilitate these efforts through clubs, events, and various activities that foster the familismo students seek.

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California State University, Fresno *Mathematics*

Tri-plane diagrams and surface knot invariants

Knot theorists are typically concerned with determining whether or not two different diagrams of a knot are really depictions of the same knot when we manipulate the (highly elastic) string in certain ways. These knots are typically imagined as having no width and living in the three-dimensional world. This means that knots are thought of as one-dimensional objects living in three-dimensional space. Because it is typically difficult to determine whether two different pictures of a knot are really the same knot, these distinctions are typically made by examining what are called knot invariants. When two diagrams for a knot have different invariants, we may deduce that the two diagrams really depict different knots. The work to be presented here takes this concept to a higher dimension, where we attempt to distinguish two-dimensional surfaces living in four-dimensional space. This brings us to the concept of a surface knot. We represent these surface knots with diagrams that we call tri-plane diagrams. We provide examples of a few of these knotted surfaces along with their associated invariants, as well as determine one of these invariants for a certain class of surface knots.

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Criminology

Courthouse Facility Dogs and Legal Professionals Perceptions

A courthouse facility dog is a professionally trained service animal whose purpose is to provide quiet, unobtrusive, and emotional help in legal procedures and settings. For example, a facility dog may be trained to sense stress and react by placing its head on a person's lap or by touching the person's leg in a way that is not distracting. Facility dogs can be used both in and out of the courtroom.

According to supporters, the presence of facility dogs is critical in creating a positive environment where a witness or victim can share their experience in a more relaxed and at ease state of being. For example, the presence of facility dogs may help survivors of violent crime feel less anxious, which in turn may improve their ability to communicate effectively and reduce feelings of trauma associated with victim testimony.

On the other hand, critics assert that facility dogs may do more harm than good. Some argue that the facility dog's presence in the courtroom may be disruptive and could influence the jury's decision in a way that is unfair to the defendant.

We plan to use snowball sampling to measure local legal professionals' perceptions and beliefs regarding courthouse facility dogs via a brief online survey including open-ended, yes/no, and Likert scale questions. The results of this survey will be used to inform future experimental research examining the impact of courthouse facility dogs on juror decision-making.

Data collection for the current study is expected to be finished by early March 2023. We anticipate that legal professionals will support the use of facility dogs in legal proceedings. This research is crucial to our understanding of legal professionals' beliefs and attitudes toward facility dogs.

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Biology

Investigating Dec-based Linker Proteins to Mediate Assembly of P22 Virus-Like Particles (VLPs)

Virus capsids function as building blocks with the ability to form higher order three-dimensional array materials. In our laboratory, virus-like particles (VLPs) derived from bacteriophage P22 are studied. Higher order assembly can be achieved through the utilization of decoration (Dec) protein which binds to the exterior surface of P22 VLPs as a linker to assist the P22 VLPs in higher order assembly. P22 has two forms: procapsid (PC) form and expanded (Ex) form. It has been demonstrated that Dec can be used to facilitate assembly of P22 in Ex form; however, the original Dec protein cannot bind to the PC form of P22. For materials development, it is advantageous to mediate assembly of P22 PC. The objective of this research, therefore, is to engineer Dec-based linker proteins to investigate the assembly of P22 in its PC form.

This investigation was initiated with computational modeling, performed by Kihara Lab at Purdue University, to evaluate protein structures which have affinity to P22 PC. The computational modeling suggests that a helix-turn-helix (HTH) bundle (i.e, gp41 core, 2L6HC3_13, and 5L6HC3_1) could exhibit high affinity to P22 PC. We then experimentally designed the Dec-based linker proteins formulated on these computational predictions. We constructed plasmids for expressing the three linker proteins genetically fused with Dec. We expressed and purified these proteins from an E. coli expression system, and assessed their capability to bind to P22 PC. Preliminary results suggest that gp41 core with Dec is associated with P22 PC. We are currently modifying the protein to prepare a ditopic linker and assess its capability to mediate assembly of P22 PC into higher order assembly. We expect that integration of computational modeling and experimental verification will be a powerful approach to design protein linkers for controlled construction of protein array materials.

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Agricultural Business

The Feasibility of Small Scale Wind Energy Machines in California Agriculture

The need for renewable energy to support us through future energy demand is present more now than ever. Specifically, California requires its utilities to achieve 90 percent clean energy by 2035. In this context, this study analyzes the potential for wind mills which can operate in low wind speeds within the agricultural sector. The two objectives of the study are:

1. Analyze the potential demand of wind energy, and the feasibility of windmills (low speed) in California agriculture.
2. Analyze the economic impact of a windmill (low speed) on a typical farm.

As much of the Central Valley of California falls under low wind speed regions, our study specifically analyzed a machine called the “Wind Mule” which can operate in such settings. The technical feasibility was performed by creating a digitized model accounting for variables such as volume flow rate of the wind, torque, force, mass flow rate, and more to ultimately estimate the power output. Our preliminary results showed that there is potential for low speed wind mills in California. The Wind Mule can generate about 9,344 kWh per year even at mild wind speeds of 3-6 mph. This is enough energy to support the water pumping for a 7.2-acre almond orchard. At present costs, the energy generated is equivalent to about \$1,775. The results show that the Wind Mule could be more effective when combined with another energy source in a hybrid system incorporating battery storage. It is estimated that the cost of manufacturing and installation of the Wind Mule is approximately \$18,500. This study will further analyze the economic feasibility of the Wind Mule by taking into consideration the long-term benefits and the scale economies that can be generated while manufacturing on a large scale.

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Chemistry

Synthesis of Precursors for Tetracyclic Bis-piperidine Alkaloids as Anticancer Agents

Natural Products have long been used to treat various diseases due to their potential therapeutic properties, especially for cancer. Due to the vigorous and limited treatments for cancer patients, natural products have been more frequently used to propose new and novel treatments. Around 60% of drugs are currently composed of natural products. A proposed treatment for cancer is tetracyclic bis-piperidine alkaloids isolated from Haplosclerida, a group of marine sponges. These alkaloids have been shown to have anti-proliferative effects towards suppressing cancer cell proliferation in leukemia, melanoma, and triple-negative breast cancer. However, many limitations are present due to the need for studies on the structure-activity relationship of alkaloids or in vivo testing in animal models due to limitations in the challenges of total synthesis of these alkaloids. Although the limitations, we are interested in developing a feasible synthetic plan to synthesize fifteen tetracyclic bis-piperidine alkaloid analogs to test their potency against cancer cell lines. We have made progress in synthesizing two critical intermediates, a boronic ester, and iodoenamine that will be precursors for the Suzuki coupling reactions. The boronic ester intermediate can be formed through an eight-step synthesis. Currently, we have completed and achieved seven of the eight steps. The iodoenamine intermediate is a five-step synthesis that is transformed through PMB-protected glutarimide. So far, four of the five steps have been achieved. One boronic ester intermediate and iodoenamine intermediate will be characterized by ^1H NMR, ^{13}C NMR, and HMBC.

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Effect of radio-transmitter collar color on predation probability in endangered Blunt-nosed Leopard Lizards (*Gambelia sila*) in the Panoche Plateau

Blunt-nosed Leopard Lizards (*Gambelia sila*) are a federal- and state-listed endangered species endemic to the San Joaquin Desert, where much of their habitat has been lost and fragmented due to land conversion for agricultural and industrial use. In 2023, researchers plan to begin repatriating captive-reared animals to the recently extirpated Panoche Plateau. Despite the species' importance and prior radio-telemetry studies, no one has yet confirmed that standardly used radio-collars do not attract increased predator attention to collared *G. sila*. Using previously validated methods, 380 effective clay models were placed at 20 locations over a 12 week period. Field cameras were paired with 16 locations to document attacks and identify predators on the Plateau. Treatments were no collar, silver, white, and bronze. Common predators captured on cameras included ravens, loggerhead shrikes, and coyotes. Less common predators included greater roadrunners and San Joaquin kit foxes. Preliminary analysis shows that collars had no effect on predation probability. It is important to ensure that predation due to increased visibility will not have a dramatic effect on repatriated individuals on the Plateau site. Understanding the impact radio-collars have on predation of *G. sila* will ultimately aid in the recovery and management of the species.

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EDD

Understanding Generation Z: Exploring Experiences of Adversity from a Latinx Children of Immigrants Perspective

This research study focused on gathering the experiences of adversity of Generation Z, Latinx, children of immigrants' in addition to exploring how they navigate those adverse experiences. Furthermore, the purpose of this study lies in recognizing the multiple and intersecting identities and experiences to advance the knowledge about Generation Z and to better understand how to support these students in a way that is relevant and recognizes students' assets and cultural capital. A pláticas methodology (Fierros & Delgado Bernal, 2016) and a community cultural wealth model (Yosso, 2005) was utilized to create spaces where students could engage in a two-way conversation that validated their cultural and personal ways of knowing and the knowledges that are derived from familial tradition, shared memories, and cultural histories. Moreover, qualitative data collection methods included audio/visual recordings of individual and group pláticas, transcriptions, and researcher generated plática summaries. The participants of this study are students of Central Coast High School (pseudonym) and members of the researcher's counseling cohort. By participating in this study, participants had the opportunity to engage in pláticas with peers and the researcher to co-construct knowledge that provided insights that served to make recommendations in efforts to advance scholarly and educational praxis. Findings of this study indicated that participants do not necessarily identify with the labels that educators and scholars from older generations have imposed on them. Moreover, findings aligned with prior research that showed that technology and digital spaces have become key tools for coping with adversity as many participants expressed difficulty being vulnerable with other peers and adults in their lives. However, participants acknowledge that they feel they don't have enough support and resources with mental health from family and educators. Overall, insights from these findings have implications for educational organizations that will challenge educators to evaluate how students' social emotional needs are being met.

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Communicative Sciences and Deaf Studies

SPEAK OUT! ® Voice Therapy for Individuals with Parkinson's Disease

This study investigated the effects of SPEAK OUT!® voice therapy for individuals with Parkinson's disease (PD). The integrated programs, SPEAK OUT!® individual therapy and The LOUD Crowd® group therapy, are provided free of charge at Fresno State's Speech, Language, and Hearing clinic. These programs are designed to improve speech impairments associated with PD. Treatment is based on the concept of "speaking with intent," which involves using greater focus, confidence, gusto, and exaggeration while performing speech movements. Movements produced more purposefully activate a neural pathway that is not affected by PD. The voice disorder associated with PD is hypokinetic dysarthria, which is characterized by reductions in volume and clarity of speech. This investigation monitored vocal intensity (loudness) and intelligibility (clarity of speech) before, during, and after treatment. A multiple baseline across participants design was used to track these speech characteristics across three participants diagnosed with PD. Participants completed spontaneous, conversational speech samples and sustained vowel productions to assess their voice. The multiple baseline across participants design required demonstration of baseline stability (with a minimum of three measurements) before SPEAK OUT!® treatment was initiated. Introduction of treatment was staggered across participants, and probe measurements were taken every session and post treatment. Treatment consisted of 12 one-on-one therapy sessions each lasting approximately 50 minutes. The results revealed that all participants demonstrated increased vocal intensity during conversational speech and vowel prolongations as compared to their baseline measures. Intelligibility measures also improved apart from one participant who had 100% intelligibility in every measurement. The multiple baseline across participants design clearly showed that the participants' vocal loudness and intelligibility improved when, and only when, they were exposed to the treatment variable. These results supported the research hypothesis which stated that SPEAK OUT!® is an effective treatment for PD-associated hypokinetic dysarthria.

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Chemistry

Investigating the Potential of Dehydroabietylamine and Abietic Acid as Antagonists for N-Terminal Domain of the Androgen Receptor

Current treatments for prostate cancer include chemotherapy, androgen deprivation therapy (ADT), and surgery can help control the spread of the prostate cancer but can later develop into castration resistant prostate cancer (CRPC). These treatments currently available can only improve median overall survival and become ineffective in CRPC due to AR gene amplification, ligand binding domain (LBD) mutation, and the evolution of AR splice variants such as AR-V7 which lacks the LBD. Targeting the N-terminal domain (NTD) is one viable option, and one recent example of a NTD antagonist is tricyclic aromatic diterpenoid QW07. However, QW07 does not show selective suppression of AR-positive cell proliferation over AR-negative one. Diterpenoids are isolated from coniferous plants such as pine trees and have shown to have antiproliferative activity against various cancers. Diterpenoids such as dehydroabietylamine and abietic acid are selected since they are readily available and have a similar core structure as QW07.

These diterpenoids are used to explore the initial structure activity relationships and potentially increase the selectivity towards positive prostate cancer cell lines. Different synthetic schemes were designed to synthesize twenty derivatives that include electron-withdrawing, electron-donating, heterocyclic, primary amine, and amide containing groups. The synthesized compounds have been characterized by ¹H, ¹³C NMR, HRMS, and IR. The antiproliferative potency of synthesized diterpenoids have been tested on AR-positive prostate cancer cell lines (LNCaP and 22Rv1) using AR-negative cell models (PC-3 and DU145) as comparison. Initial preliminary antiproliferative data from WST-1 bioassay indicated that dehydroabietylamine, abietic acid, and dehydroabietylamine can suppress AR-positive prostate cancer cell proliferation and aromatization increases selectivity towards 22Rv1. The evaluation of the remaining derivatives is in progress in hope to potentially increase potency.

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Plant Science

Biomass Production and Biological Nitrogen Fixation by Fababean (*Vicia faba* L.) in Various Cover Crop Mixes

In recent years, environmental quality, biodiversity, and agricultural production have declined significantly due to conventional agricultural practices such as intensive tillage, short or no fallow, monocultures, leaching, and excessive use of inorganic fertilizers (Dabney et al., 2010). Moreover, an expenditure of \$3.6 billion yearly on herbicides (Pimentel and Levitan, 1986), has not resulted in the reduction of weeds, and reduced output by 10% (Shaw, 1982). Soil degradation from intensive cropping production and resultant losses in productivity requires the use of rejuvenating practices to rebuild soil health and crop productivity potential. Therefore, cover crops are now recognized as an important component of sustainable production in most areas of California because of their potential for biological nitrogen fixation and biomass addition into the soil. The production of fava bean biomass is typically higher than most other legumes, achieving 20-40 tons per acre, with a nitrogen fixation rate of 90 to 200 lbs. per acre (Hickman and Canevari, 2018; Jensen et al., 2010). In this experiment, the biological nitrogen fixation and biomass addition are examined in various crop mixes in a split-plot design. The crops include fababean (*Vicia faba* L.), oat (*Avena sativa*), mustard (*Brassica* sp.), radish (*Raphanus sativus*), pea (*Pisum sativum*), and vetch (*Vicia* sp.) with different seed rates. Five best-performing fababean lines (En 39, Bell Bean, En 3, SSN-1, and En-15) were selected from a panel of 63 previously tested fava bean germplasm lines and were examined for various parameters such as root length, shoot length, nodule count, dry weight of nodules, and leaf area. N derived from the atmosphere (%Ndfa) and total N will be presented.

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California State University, Fresno *Plant Science*

Can Satellite Time Series Data Discern Spatial Patterns in Dry Matter Yield in 'Jose' Tall Wheatgrass Fields under High Salinity Conditions in the San Joaquin Valley of California?

As the San Joaquin Valley continues to face drought and rising temperatures, alternative waters that are often saline will increasingly be used for irrigation. Using saline water for crop irrigation has benefits for water conservation, but it poses some challenges such as salt accumulation in the root zone, potentially leading to osmotic and toxic ion stress in the crop. The use of time series data from satellite imagery has shown promise for predicting vegetation seasonality and allowing growers to maximize yields. Nevertheless, frequent data loss due to climate variability, erratic time sampling and insufficient ground-truthing threatens the accuracy of these modeling techniques. The San Joaquin River Improvement Project (SJRIP) is a 6,500-acre facility located in the Grasslands Drainage Area that reuses saline drainage water coming from 98,000 acres of productive farmland to irrigate forages and reduce saline discharge into the river. The intent of this research is to provide rapid and accurate decision support tools to SJRIP managers by developing a time series model of tall wheatgrass growing seasons using satellite images and vegetation indices. Using four fields ranging from 70 – 88 acres, satellite images from Sentinel-2 will be analyzed, and Normalized Difference Vegetative Index (NDVI) values will be calculated and compared to forage dry matter yield to determine whether time series data can guide harvest periods and/or identify declining yield due to salt accumulation in the root zone. The overall objective of the research is to assess the potential of using satellite imagery as a management tool for tall wheatgrass production under saline-sodic irrigation to improve the long-term sustainability of the forage production.

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Mathematics

ZERO DISTRIBUTION OF POLYNOMIALS GENERATED BY A POWER OF A CUBIC POLYNOMIAL

This paper studies the distribution of the zeros of the sequence of polynomials $\{P_m(z)\}_{m \geq 0}$ generated by $(1+B(z)t+A(z)t^3)^{-\alpha}$, where α is an arbitrary fixed positive real number and $B(z)$ and $A(z)$ are arbitrary polynomials. We construct a curve in the complex plane containing all but four of the zeros of $P_m(z)$ for $m > 2.1875/\alpha$.

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Criminology

Does Support for Law Enforcement Predict Color-Blind Racial Attitudes Beyond Empathy and Just-World Beliefs?

Recent, highly publicized instances of police brutality against racial minorities have reignited awareness of color-blind racism in America. Prior research has examined the role of empathy and just-world beliefs on color-blind racial attitudes. Drawing on social dominance orientation theory, we extend these findings to consider the role of perceived police legitimacy in shaping individuals' racial attitudes and beliefs. In a survey of young adults enrolled at Fresno State ($n = 143$), we examined the relationship between perceived police legitimacy and three forms of color-blind racial attitudes: racial privilege, institutional discrimination, and blatant racial issues. Specifically, we examined whether perceived police legitimacy predicts each form of color-blind racism after controlling for age, gender, ethnicity, and social desirability. We also assessed whether perceived police legitimacy remains a meaningful predictor even after accounting for participants' empathy and just-world beliefs. Relative to our control variables, perceived police legitimacy accounted for significantly more variance in racial privilege (adjusted $r^2\Delta = .179$, $p < .001$), institutional discrimination (adjusted $r^2\Delta = .055$, $p = .003$), and blatant racial issues (adjusted $r^2\Delta = .084$, $p < .001$). In addition, just-world beliefs explained unique variance above and beyond our other predictors for all three forms of color-blind racial attitudes (β s > 0.205 , $ps < .045$, $r_{\text{partial}} > .173$). Finally, affective empathy uniquely predicted participants' beliefs regarding institutional discrimination ($\beta = -0.361$, $p = .023$, $r_{\text{partial}} = -.195$) and blatant racial issues ($\beta = -0.387$, $p = .003$, $r_{\text{partial}} = -.253$), but not racial privilege ($\beta = -0.130$, $p = .504$, $r_{\text{partial}} = -.058$). These findings suggest that specific attitudes towards social institutions may be stronger predictors of color-blind racial attitudes than general beliefs and psychological processes (e.g., empathy and just-world beliefs). We highlight the need for additional research examining color-blind racial beliefs and attitudes toward legal institutions.

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Art and Design

(Re-)Contextualizing Pre-Christian Scandinavian Concepts of Personhood Through Re-Analysis of the Hårby Figure

My research seeks to challenge worldviews considered inherent by re-framing previous approaches to Viking art studies and suggesting perceptions of personhood (like binary gender) are not universal between cultures, nor across time and space. The Hårby Figure, a prime example of a Viking art object from the current corpus of Late Iron Age metal figurines from Scandinavia which have been classified as “female” or “Valkyrie” (or both), demonstrates that notions held by the dominant group, considered as such to be inherent and universal, determines how material culture is interpreted. While binary biological sex is linked to gendered roles contemporarily, perceptions of personhood are contextually specific. The application of biological sex classification using “male” or “female” labels (“sexing”) limits our ability to reconstruct undistorted pre-historic (pre-Christian) concepts. Modern knowledge of Norse pagan mythology is heavily based on, and limited by, the extant written stories recorded by Christian authors after the conversion of Scandinavia to Christianity. Just as sexing hinders our ability to reconstruct gender role concepts within a pre-historic society, using the definition of “Valkyrie” from Christian-authored sources for interpretation and/or identification does not consider the original meaning of the art object within a pre-Christian context. Fundamentally, the purpose of my research is to question previous methodology and scholarly application of generalized information by re-analyzing the Hårby Figure and its iconography. I use an interdisciplinary art historical approach informed by gender and intersectional feminist studies, as well as burial archaeology, in an effort to generate interpretive models that may more closely approximate pre-Christian perspectives and concepts held by the art object’s creator(s) and audience. While a definitive interpretation is not possible due to limited surviving information, my re-analysis of the Hårby Figure provides a reconstructed model, considerate of the object’s original context.

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Physics

Numerical Simulation of Shock Waves using the Burger's Equation

Burger's equation is a nonlinear partial differential equation used to model viscous flow in fluid mechanics. It describes dissipation of the velocity vector field of a fluid and, under certain conditions, develops interesting behavior such as shock waves and pseudo-turbulence. Burger's equation is simple enough to still have a complete analytical solution, making it highly useful for benchmarking computational techniques before they are applied to more advanced equations, such as Navier-Stokes.

A finite difference method was used to numerically solve the Burger's equation for the velocity field of a two-dimensional fluid. The results of this program were compared with analytical results to gauge the accuracy of the implementation. The simulation then was used to generate and model the time evolution of a shock wave propagating through a fluid. The trajectories of particular points in the fluid were determined using a numerical integration. This information was used to obtain a visual representation of the motion of the fluid as well as to observe changes in density.

The results demonstrated an interesting trade-off between formation of a shock wave and dissipation of energy in the fluid. For low viscosity, the fluid would quickly form a shock wave that would slowly dissipate. For higher viscosities, the energy of the system would dissipate before a shock front could form. Although this was a good model of the shock formation and decay, the behavior of the density around this shock front was quite unphysical. This indicates that Burger's equation, although a useful model, is missing some necessary information to a complete description of a shock wave. Further research is being done to recreate similar results using the more robust Navier-Stokes equation.

**POSTER
PRESENTATION
ABSTRACTS**

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Nursing

Oral chemotherapy compliance for acute lymphocytic leukemia (ALL) patients on maintenance therapy: a quantitative descriptive study

Background: Oral chemotherapy nonadherence is often a challenge in pediatric oncology.

Children and adolescents with ALL must adhere to a treatment that includes daily self or parent-administered oral chemotherapy for two years. Unfortunately, close to one-third of patients on these treatment plans experience some form of nonadherence with home medications (Landier et al., 2011). Pediatric patients who were nonadherent to 6MP demonstrated a 2.7-fold higher risk of relapse than adherent patients" (Coyne et al., 2019, pp. 219–220).

Methods: This will be a quantitative descriptive study to determine the effectiveness of weekly messages to families through the EMR, or through phone calls to determine missed doses of oral 6-MP and methotrexate during at least one period (up to two months) for patients on the maintenance arm of treatment for acute lymphoblastic leukemia.

Results: To be determined after data analysis

Discussion/Conclusion: to be determined after data analysis

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Public Health

Fresno County Community Climate Change Survey

Introduction: The effects of climate change have been shown to negatively impact the San Joaquin Valley. Thus, it is important to understand the overall knowledge, beliefs, and opinions on climate change of Fresno County to inform policymakers. The objective of this study was to understand the knowledge, beliefs, and opinions toward climate change that Fresno County residents hold.

Methods: Data was collected from a community-wide survey distributed in a cross-sectional study design. The survey utilized Likert-Type scales to quantitatively measure collected ordinal data. The survey was distributed to Fresno County residents using snowball and convenience sampling methods. SPSS software analyzed statistically significant trends among participant responses via one-way ANOVA test.

Results: There were 133 survey respondents. Among the respondents, 62% indicated that they “strongly agree” the climate is changing. There was a statistically significant difference between age groups in the importance of knowing about environmental problems and issues ($p < 0.05$). When comparing the four age groups, Boomers were most likely to “strongly agree” with this statement ($M = 3.94$, $SD = .24$) and Generation Z were least likely to agree as strongly ($M = 3.28$, $SD = .78$). There was also a significant difference in the average responses toward believing there is evidence of global climate change between the five districts of Fresno County ($p < 0.05$). Specifically, respondents living in District 1 did not agree as strongly to the statement ($M = 3.58$, $SD = .67$) when compared to the other four districts, respectively ($M = 4.00$, $SD = .31$; $M = 3.89$, $SD = .31$; $M = 3.93$, $SD = .27$; $M = 3.93$, $SD = .34$).

Conclusion: After conducting statistical analysis, all age groups generally agree on the importance of knowing about environmental issues, with Boomers feeling the strongest toward staying informed. Likewise, all districts across Fresno County believe in global climate change, but District 1 to a lesser extent. Future policy recommendations and climate advocacy projects should consider these findings in their community interventions.

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Psychology

Changing Mood Through Autobiographical Memory Retrieval

Autobiographical memories are often associated with strong emotions. Previous research in mood congruent memory demonstrates that one's current mood affects what is noticed and what is retrieved from long-term memory. However, there is little research on how autobiographical memory retrieval affects one's current mood. One experiment showed that valenced semantic and episodic cues changes mood in the cued direction. The present study investigated whether episodic cues alone would change mood. Participants (N = 170) were randomly assigned to a memory condition that prompted the recall of positive, neutral, or negative autobiographical memories. After memory recall, participants' mood was measured on three different scales: a Visual Analog Scale (VAS), the Positive and Negative Affect Schedule (PANAS-SF), and the Brief Mood Introspection Scale (BMIS). We hypothesized that recalling positive, neutral, or negative memories would affect mood in the valenced direction. Results demonstrated no effect of the memory manipulated on current mood, regardless of whether participants guessed the point of the experiment. The implications of this research range from understanding experimental research on emotions and memory to providing practical advice on personal strategies for mood induction. We conclude that semantic and episodic memory recall may have stronger effects on mood than recall of emotional autobiographical memories alone. Suggestions for future research include investigating the relative weight of semantic versus episodic cues in mood induction.

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Nursing

Cardiac Rehabilitation Programs and Cardiac Readmissions

Intro: Coronary artery disease is a prevalent and preventable heart disease in America, robbing people of their quality of life and longevity. The disease's progression may lead some cardiac patients to require cardiac surgical intervention in the form of percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG). However, quality of life and longevity are not simply restored by surgical intervention, as evidenced by the number of post-cardiac intervention patients readmitted for cardiac-related symptoms. This indicates that more intervention is necessary to restore the cardiac health of the patients who have undergone cardiac surgical intervention.

Background: The aim of this research is to determine whether cardiac patients who attend cardiac rehabilitation programs have fewer cardiac-related readmissions compared to cardiac patients who do not attend a cardiac rehabilitation program. The project focuses on post-CABG, post-PCI, and heart failure patients and compares their readmission rates to the national average readmission rates. The study hopes to prove that cardiac rehabilitation programs are a necessary component for all cardiac patients and their cardiac health. Furthermore, the post-rehabilitation hospital readmissions that do occur will be analyzed to determine whether trends exist to better optimize cardiac rehabilitation programs overall.

Methods: A retrospective chart review of the Cardiac Rehabilitation Program EHR of a local Central Valley hospital and its associated Emergency Department was conducted. The cardiac-related readmission rates of the post-CABG, post-PCI, and heart failure patients were then compared to the national average cardiac-related readmission rates for all patients with these diagnoses. There are no immediate or physical risks to any human subject. The only potential risk is a breach of privacy, which will be avoided by coding patient information as it is collected, storing it on a password-protected cloud data storage, and storing it on a password-protected device.

Results: Pending

Conclusion: To be determined.

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Public Health

Air Pollution and Population Growth: Understanding Air Quality Through the Context of Urban Growth in Fresno

Like many mid-sized cities in the US, Fresno has been experiencing moderate population growth. Although previous literature has determined that a growing population leads to more emissions, this relationship has not been established for less densely populated, mid-sized cities, like Fresno. Fresno has some of the poorest air quality in the US, resulting in a multitude of health complications which are prevalent at rates above the national average, such as asthma.

While this can partially be attributed to the geography of the San Joaquin Valley and seasonal variation, the issue is exacerbated by traffic-related air pollutants, such as Particulate Matter 2.5 (PM2.5) and Ozone. A growing population may lead to an increased number of vehicles on the road, resulting in an increase in pollutant concentration.

An exploratory analysis was conducted in order to characterize the relationship between population growth in particular zip codes and localized pollutant concentrations. Pollutant concentration data for PM2.5 and Ozone was compiled from the California Air Resources Board (CARB) online database. The results show that within all three zip codes examined over the time period of 2013 to 2018, there was a negative association between population size and air pollutant concentrations. This relationship was best observed in Zip Code 93612, where there was a 5µg/m³ difference between a population that was 1,000 individuals smaller. Across the three zip codes examined, there was not a significant difference in air quality, as the concentrations ranged from between 1-3µg/m³. Ozone concentration also exhibited a similarly negative association.

In recent years, areas that were previously zoned for light industrial work within and surrounding the zip codes examined have been rezoned for residential and public use. This would decrease the amount of pollutants residents are exposed to from industrial traffic and general industrial activity.

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Chemistry and Biochemistry

Real-time enzyme kinetics using quantitative ^{19}F NMR. Application hydrolysis of N-trifluoroacetyl glycine by Acylase I

The objective of this study is to employ the technique of real-time quantitative ^{19}F -Fluorine (^{19}F) Nuclear Magnetic Resonance (NMR) spectra in a biochemical study of enzyme activity. ^{19}F NMR monitors the enzyme-catalyzed hydrolysis of N-trifluoroacetyl glycine into trifluoroacetic acid and glycine to investigate the metabolic rate of an enzyme. Unlike ^1H NMR, ^{19}F NMR avoids solvent peak interference, making it a valuable tool for the qualitative and quantitative identification of components in an aqueous solution. Additionally, fluorine-substituted biomolecules open a broad spectral dispersion for biomolecular structure and dynamics in solution. The progress of the enzyme-catalyzed hydrolysis reaction of N-trifluoroacetyl glycine is presented through ^{19}F NMR spectra, which depict the conversion of fluorines on the trifluoroacetyl moiety to the fluorines of trifluoroacetic acid. Through the use of different concentrations of substrate and a set concentration of enzyme, we can estimate the maximum velocity (V_{max}) and Michaelis-Menten constant (K_M). The findings of this study highlight the advantages of using a real-time ^{19}F NMR spectroscopy over ^1H NMR for studying enzyme activity, making it a valuable tool for future biochemical research. This facilitates experimental designs in which the requirement to produce copious quantities of substrate and enzyme concentrations to monitor the time course of the enzyme-catalyzed reaction is no longer necessary.

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Chemistry and Biochemistry

Structural Insight into an Anti-tumor Antibody Bound to a MUC1 Glycopeptide

While the cancer mortality rate in the United States continues to decline, cancer remains the second leading cause of death across the nation. Over the past number of years, monoclonal antibodies (mAbs) have emerged as alternative pharmaceuticals and have been utilized as regimens for the treatment of cancer. In noncancerous cells, the glycoprotein mucin 1 (MUC1) serves as a physical barrier against invading pathogens and acts as a lubricant for epithelial cells. However, in malignant cells MUC1 exhibits truncated and atypical glycosylation, leaving traditionally inaccessible epitopes exposed. Possessing high antigen affinity, tumor specificity, and increased selectivity for Tn-glycosylated MUC1, PankoMab (Gatipotuzumab), is a humanized mAb under investigation as an immunotherapy for the treatment of ovarian cancer. We aim to elucidate the structure of PankoMab in complex with a MUC1 glycopeptide to determine the mechanism behind the selectivity of the mAb for the glycosylated antigen. Recombinant PankoMab was produced as both a Fab fragment and IgG. The genes for the antibody light chain and heavy chain were cloned into pcDNA 3.1 using a modular cloning approach mediated by Gibson assembly. Antibody was produced by transient transfection in expiCHO cells. Protein expression was confirmed by SDS-PAGE and purified using Nickel or Protein A affinity chromatography. Interaction of the protein with 5 copies of the MUC1 tandem repeat fused to GST was confirmed by ELISA. The binding kinetics of the Fab fragment for a MUC1 peptide and MUC1 Tn glycopeptide were determined by Surface Plasmon Resonance, confirming the selectivity of the protein for the glycopeptide form of the antigen. Going forward, purified PankoMab Fab will be complexed with a MUC1 peptide and glycopeptide to determine the structural basis for the mechanism. Ultimately, a structural understanding of PankoMab Fab and its binding mechanisms to MUC1 may contribute towards the advancement of antibody-mediated immunotherapies.

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California State University, Fresno -

Biology

Investigating the Effectiveness of Acetylcholinesterase Inhibitors in Reducing Planning Deficits of Alzheimer's Disease in *Drosophila melanogaster*

Reduced executive function and the ability to plan out activities are associated with Alzheimer's Disease (AD). The mechanisms underlying disease progression are not well understood, but AD pathology is characterized by an accumulation of pathological proteins, including tau aggregates, in the nervous system. Acetylcholine (ACh) is one of the first neurotransmitter systems impaired in AD, resulting in diminished modulation in multiple brain regions. To slow the cognitive effects of the ACh neuron death, AD patients are often treated with inhibitors of the enzyme that degrades ACh, acetylcholinesterase (AChE). Our research focuses upon quantitatively analyzing changes in visuomotor planning behavior in *Drosophila melanogaster*, the fruit fly, expressing human tau in the mushroom bodies, brain regions critical for learning, memory, and spatial behaviors. We hypothesize that inhibiting AChE with an AChE inhibitor would slow the progression of the disease and improve planning behaviors in flies. Our research is unique as it explores behavioral analyses not previously studied, advancing the flies model as a holistic model for understanding AD.

A modified tap-down apparatus was used to examine flies' ability to plan their movements efficiently when faced with high contrast visual barriers while climbing. Behavior was quantified as a function of time to complete the task, along with time spent edge crawling and under barriers. Flies expressing tau were treated with the AChE inhibitor galantamine hydrobromide and compared to untreated tau and control flies. Results revealed quantifiable differences in behavior, with AChE treatment statistically improving fly's time to complete the task and with less variability. We also noted that treated flies spent less time following edges and under barriers, suggesting they do not rely on edge following to complete the task. These results indicate that AChE inhibitor treatment may rescue diseased phenotypes associated with AD in *Drosophila* and beyond.

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Biology

Differential Gene Expression in Sub-Populations of a Metastatic Breast Cancer cell line

Breast cancer is the most common solid tumor in women and the second greatest cause of cancer-related mortality globally. Metastatic breast cancer causes the vast majority of deaths from the disease. Using a metastatic breast cancer model system, MDA-MB-231P and MDA-MB-231Bo (bone-seeking clonal cell line), we observed differences in cell size when growing cells in culture conditions. Generally, cells do not express a dissimilarity in size, so the question arises as to why this cell size difference occurs and is there a significant difference at the genetic levels of these cells?

Subculturing of both cell lines was performed and followed by cell sorting to enrich for smaller (S) and larger (L) sub-populations (i.e., 231P-L, 231P-S, 231Bo-L and 231Bo-S). Each cell line was amplified to 20 million cells with a viability of ~95% and sorted using BD FACS Aria III (UCMerced SCIF Facility). A forward scatter versus side scatter plot was obtained which was double gated to gain insight on the subpopulations. From the original cell lines, we found 0.2% of the suspected large population (231P-L) and 0.1% from the bone-seeking clone (231Bo-L) was present. These were amplified and various cell characteristics are reported. In addition, these cells were grown for RNA isolation and targeted RNA sequencing that will be conducted on each sub-population to determine differential gene expression as it correlates with differences in cellular size. RTq-PCR will be used to validate these results. When these sorted subpopulations were put into culture, a mixture of sizes were still obtained. To minimize this, clonal amplification was also performed by plating single cells in each well of a 96-well plate to obtain 'pure' cultures. These findings could provide a broader understanding of why such a size phenomenon occurs in a standardized cell line and yield new opportunities for biomarker discovery in breast cancer metastasis.

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Biology

Assessing the effects of luteolin on reducing the effects of zinc-induced hyperphosphorylation of tau and its impacts on behavior in a fruit fly model of Alzheimer's disease

Alzheimer's disease (AD) is a prevalent form of dementia that causes a decline in memory and cognitive abilities. AD is characterized by the aggregation of two types of proteins, beta-amyloid and tau, in the brain. The aggregation of tau proteins, which can be influenced by zinc, results in neurofibrillary tangles, a hallmark of the AD brain. A previous in vitro study investigated the effects of zinc on tau phosphorylation, and found that zinc resulted in abnormal tau phosphorylation at Ser 262/356. Furthermore, Luteolin, a flavonoid commonly found in fruits and vegetables, was found to lessen zinc-induced hyperphosphorylation (Zhou et al., 2012). While others used in vitro methods, our study aims to conduct an in vivo study on the effects of zinc and luteolin on tau phosphorylation and subsequent neurofibrillary tangles. More specifically, this study is designed to assess the effects of luteolin on zinc-induced tau phosphorylation at Ser 262/356 and the protective effects of luteolin on learning and memory in the model organism *Drosophila melanogaster*. This was accomplished using a visual place learning assay, which assesses the spatial learning and memory of the flies. Flies were crossed to express normal human tau and tau with mutations at Ser262/356 that lead to hyperphosphorylation. These flies and control flies were raised on zinc rich food and either given luteolin or not. Flies were then trained in a visual place learning assay and their learning abilities and memory assessed. The results of this experiment suggest that luteolin may have an impact on the behavior of flies that experience zinc-induced tau phosphorylation at Ser 262/356.

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Biology

Functional investigation of palladin knockdown in 2D and 3D pancreatic cancer cell cultures

Pancreatic ductal adenocarcinoma (PDAC) remains one of the deadliest types of cancer due to insufficiency of reliable biomarkers leading to late diagnosis, ineffective treatment strategies and high incidence of metastasis. This investigation explores an actin-associated protein called palladin (PALLD), as a potential biomarker, that has been identified to play a role in increased invasion and metastasis. Studies have shown major variations in physiological features like altered gene and protein expression associated with cancer cells grown in 2D compared to 3D cultures. The objective of this research is to evaluate the differential PALLD variants (isoforms) expression in select pancreatic cell lines and compare the expression levels in 2D and 3D culture. The central hypothesis is that PALLD isoforms will vary during different methods of culture (2D vs 3D). To build upon this work, 3D spheroids have been cultured by hanging drop method, in different viscosity medium to identify the optimal spheroid forming conditions. To identify the differential PALLD isoforms expression, primers specific to isoforms 1, 3 and 4 are being used to conduct RTq-PCR on both 2D and 3D cell cultures to determine the baseline gene expression. The results will be validated by Western blotting. The inhibitory effects of downregulating PALLD will be studied by introducing siRNA and its functional effect evaluated by invasion assays. This study will not only increase the chances of predicting reliable markers at an early stage of pancreatic cancer aiding in early cancer screening and diagnosis, but will also help in effective cancer therapies, thus, improving pancreatic cancer patients' survival rates.

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Chemistry and Biochemistry

Video-Analysis Study of Student and Instructor Interactions in a Guided-Inquiry Laboratory

Laboratory work can provide valuable opportunities for students to engage in the practical applications of science concepts. However, conventional laboratories often fail to go beyond verification “hands-on” experiences, where the outcome is already known, to also include “minds-on” experiences across the scientific process. Greater efforts are being made to establish laboratories that better reflect the practices of scientists by supporting student creativity through more inquiry-oriented approaches. Of the various levels of inquiry, guided inquiry is a popular approach as it acts as a balancing point between student creativity and manageable classroom structure. Further, guided-inquiry studies have demonstrated many promising results for student conceptual gains. However, there has been a lack of qualitative studies on how students in guided inquiry laboratories interact with their instructors and the curriculum, and whether actual inquiry is supported through such interactions. To this end, this detailed video-analysis study conducted 12 video observations of three laboratory instructors’ classrooms (Four observations each) to investigate how interactions advanced or subverted students’ inquiries. This talk will present exemplars of interactions based on Mortimer and Scott (2003) science sensemaking framework, illustrating both critical and practical supports for enhancing student inquiry from an instructor’s perspective.

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Nursing

The Benefits of Movement Therapy in the Quality of Life in Parkinson's Disease Patients

Background: Nearly one million people in the United States live with Parkinson's Disease (PD), and 90,000 people are diagnosed annually. PD is a neurodegenerative disorder characterized by various symptoms, including but not limited to motor symptoms such as resting tremor, bradykinesia, rigidity, postural instability, stooped posture, and freezing. In addition to motor symptoms, clients may experience non-motor symptoms such as cognitive and behavioral symptoms, sleep disorders, autonomic dysfunction, sensory symptoms, and fatigue. An estimated \$52 billion dollars is spent annually in the U.S. on indirect and direct Parkinson's costs. Medications cost around \$2500 annually, and therapeutic surgeries average \$100,000 per person. Exercise in conjunction with medical therapies can help lower costs and slow the progression of the disease.

Objective: This study aims to prove the benefit of exercise or movement therapy on the quality of life in individuals diagnosed with Parkinson's disease. Parkinson's disease is the second most prevalent neurodegenerative disease after Alzheimer's nationwide. Fortunately, being diagnosed with Parkinson's disease does not necessarily shorten a person's life- it will, however, make day-to-day activities more difficult and diminish a person's quality of life.

Methodology: This project is a quantitative cross-sectional correlation study of PDQ-39 and the Godin Leisure-Time Exercise questionnaire. The PDQ-39 questionnaire assesses eight dimensions of quality of life: activities of daily living, attention and working memory, cognition, communication, depression, functional mobility, quality of life, social relationships, and social support. The Godin Leisure-Time Exercise Questionnaire measures the number of times, in seven days, that a person exercises for at least 15 minutes a day. Participants need to be diagnosed with Parkinson's disease and be at least 18 years of age.

Results: Ongoing.

Conclusion: Pending results of surveys. A deadline for participants has been set for February 28, 2023.

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Mathematics

Modeling Environmental Factors Effects on Valley Fever Rates

Coccidioidomycosis, also known as Valley Fever, is a disease caused and transmitted by the fungi *Coccidioidomycosis immitis* and *Coccidioidomycosis posadasii*. The disease affects the lungs and is endemic to arid regions within the southwest United States. While studies have been conducted to analyze disease severity and quantify risk factors, few focused on creating a mathematical model to study and quantify specific environmental parameters which affect transmission. Valley Fever is not typically spread from person to person, so understanding environmental factors which do affect transmission can help us better predict future occurrences of the disease. Using publicly available data from the last two decades, we will construct a mathematical model which considers air quality in our study. Specifically, we will use regression analysis and decision trees to investigate patterns between those specific environmental parameters and case occurrences. Air quality is currently a central focus with an overview of the yearly and monthly trends for the disease as they relate to good, moderate, and unhealthy air quality levels. Our goal will be to better inform future predictions of case occurrences based on these environmental factors and identify possible non-environmental factors which could serve as the basis of future studies.

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Nursing

Readmission Rates for Individuals with a Wound or Ostomy Receiving Intervention by a Certified Wound and Ostomy Nurse in an Outpatient Setting

Abstract

Background: The Central Valley of California is home to children with complex medical needs, such as wound and ostomy services that require managed care by specialists. A substantial number are discharged from hospitals regularly with disruption in skin integrity, including chronic wounds or ostomies. Recent legislation has identified hospital readmission rates as a quality measure. This change has forced healthcare systems to examine discharge and follow-up processes. In current literature and studies, readmission rates are being scrutinized, suggesting they are often preventable with good communication and timely follow-up care by primary care providers and specialists.

Objective: This project seeks to evaluate readmission rates for pediatric patients that were provided post-hospitalization care by a certified wound and ostomy nurse (CWON). It will add to the current literature by demonstrating the effects of a CWON in an outpatient setting. Data obtained may suggest a reduction in hospital readmissions, resulting in potential cost savings. An additional financial benefit may include avoiding future secondary financial penalties for unnecessary readmissions.

Methodology: This is a quantitative study with a descriptive correlational design. A single-center, retrospective chart review of 512 medical records was conducted of those admitted to a Children's specialty hospital from January 1, 2017, through December 31, 2021, who had a complex wound or ostomy at discharge. Hospital readmissions of those with CWON and those without post-hospitalization interventions were compared. The data collected were analyzed using IBM[®] SPSS[®] software.

Results: Data collection is ongoing.

Conclusion: Pending results of the data collected. Data collection will end on February 27, 2023.

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Biology

Asp53 substitutions in the cAMP receptor protein confer cAMP-free activity

The cAMP receptor protein (CRP) acquires its DNA-binding and transcriptional activation activity upon cAMP binding. The beta4/beta5 loop of CRP has been implicated to be important for cAMP-induced CRP activation. However, the mechanistic detail remains unknown. Alanine substitution at Asp53, a residue located in the tip of the beta4/beta5 loop, is known to elevate basal CRP activity in the absence of cAMP. To determine whether the cAMP-free activity observed in D53A CRP is due to the absence of Asp53 or the introduction of alanine, we randomized the codon for CRP Asp53 in the A144T CRP background to create a pool of plasmids that encode all 20 possible amino acids. We then introduced the plasmid pool into a CRP reporter strain and screened for D53X/A144T CRP mutants with elevated cAMP-free activity compared to A144T CRP. Positive candidates which comprised 34.8% of the total colonies on the screening plate were collected and sequenced to reveal their codons and amino acid substitutions. Many substitutions (Gly, Tyr, Lys, Arg, Ala, Asn, Cys, Phe, Gln, Val) were found to elevate cAMP-free activity at position 53 in the A144T CRP background. This result indicates it is more likely the absence of Asp53 in these CRP mutants that is causative to the elevation of cAMP-free activity. The structural inspection shows that Asp53 forms an ionic interaction with Lys57 in the apo-CRP. We hypothesize that the Asp53-Lys57 stabilizes the inactive CRP conformation. Consequently, a mutagenic severance of the ionic interaction in D53X/A144T CRP mutants would destabilize the inactive form, thereby shifting the protein equilibrium to the active form and resulting in an increase in cAMP-free activity. This work provides a plausible explanation as to how an Asp53 substitution in CRP can confer cAMP-free activity.

Stephanie Chan

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Central Valley Health Policy Institute

The influence of Asian and Indian culture on the Asian-American Pacific Islander and Indian community health worker experience in Fresno County during the COVID-19 pandemic

Objective: This study documented the experiences and observations of Hmong and Punjabi COVID-19 community health workers (CHWs) working in underserved areas in Fresno County.

Methods: CHWs self-identifying as Asian American Pacific Islander (AAPI) or Indian shared their personal and work experience in focus groups. We coded focus group transcripts, calculated percent frequencies, and analyzed data for key themes.

Results: CHWs self-identified as either Hmong (n=7) or Punjabi (n=7). The foremost answer for successes of the CHW experience include improved communications within the AAPI and Indian communities (50% of category codes). The most frequent challenges during CHW work were misinformation about COVID-19 (29.7%) and cultural barriers preventing COVID-19-related support (24.3%). The most observed experience of community members was COVID-19 related stigma or discrimination (20%).

Conclusion: Fresno County Hmong and Punjabi COVID-19 CHWs shared unique experiences. CHW-led communications allowed for overcoming language barriers within Fresno Hmong and Punjabi communities. This resulted in high turnout of community members being tested and vaccinated for COVID-19. However, COVID-19 misinformation and cultural barriers to COVID-19 resources pushed the boundaries of Hmong and Punjabi livelihoods. Hmong CHWs shared altered ceremonial practices for funerals due to shelter-in-place policies. Punjabi CHWs reported religion-related challenges of proper mask wearing among turban-wearing and bearded male members. Both communities experienced technological access challenges among elders attempting to schedule COVID-19 testing or vaccination appointments. Finally, Hmong CHWs expressed anti-Asian sentiment within their communities. This research suggests a need for in-depth analyses of specific cultural impacts on the health needs of Asian and Indian communities in Fresno.

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Mathematics

Pedagogy: Its Measurement and Effects on First Semester Calculus I Students

This thesis aims to explore pedagogy in a first-semester calculus I course at California State University Fresno (CSU Fresno). As a gatekeeping course to STEM fields, calculus often leads students to switch to a non-STEM major. CSU Fresno aspires to redesign the calculus curriculum to close achievement gaps for first-generation, low-income, and underrepresented minority students (URM). CSU Fresno has redesigned its traditional calculus course into reformed calculus. Traditional and reformed calculus take different pedagogical approaches to calculus instruction. This paper will construct a theoretical framework for measuring how each pedagogical approach affects student learning, the classroom environment, and academic achievement. The newly constructed theoretical framework will be applied during classroom observations. Additionally, we will use a survey based on the URSSA and LCAS to measure how pedagogy affects students' motivation, self-efficacy, and collaborative ability. Interviews will also be conducted to supplement the survey.

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Viticulture and Enology

Fermentation with *Saccharomyces uvarum* as a strategy to mitigate the effects of low acidity produced by warm climate in Central Valley wines

District 13 in the Central Valley is the region responsible for producing the vast majority of grapes in California. Winemaking grapes grown in this warm climate region, are known for losing malic acid during their ripening period, requiring winemakers to add organic acids for avoiding microbiological and chemical stability problems. The yeast *Saccharomyces uvarum* has been identified as a biotechnological tool to address the adverse effects of warm climate grape growing because of its ability for producing malic acid during alcoholic fermentation. The effect of *S. uvarum* on the composition of wines remains to be studied with local grapes to have a better understanding of its capacity for acidification, flavor enhancement, and fermentation kinetics. This project aimed at comparing the effect of *S. uvarum* with the traditional yeast *Saccharomyces cerevisiae* on the basis of the chemical and sensory properties of red and white wines produced from Central Valley grapes. The experiment was a factorial design that included grape varietal (Albarino, Cabernet Sauvignon, and Muscat) and yeast strain (*S. cerevisiae* and *S. uvarum*) as independent variables. Fermentations for each treatment were done in triplicate. Our results showed that *S. uvarum* was able to increase the concentration of organic acids in wines of Cabernet Sauvignon, but not in Muscat. In addition, the use of *S. uvarum* was also able to increase the concentration of volatile compounds responsible for fruity and floral aromas. The fermentation kinetics were similar to those from the traditional *S. cerevisiae* confirming the viability of completing the fermentation process according to standard practice.

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Viticulture and Enology

The Impact of Biofungicides on Fermentation and Aromatic Profile from Chardonnay Wine Grapes of Central Coast of California

Chardonnay is the most widely planted variety on the Central Coast of California, but it is susceptible to many diseases, notably powdery mildew and botrytis bunch rot. Synthesized fungicides are commonly used in vineyards. However, these fungicides are costly and can harm the environment and human health. Moreover, frequent use of fungicides could develop pathogens' resistance. This project aimed to investigate the impact of biofungicides on Chardonnay wine fermentation and wine aroma profile from the Central Coast of California.

Eight experimental trials on Chardonnay wine grapes were conducted, including three combinations of biofungicides and synthetic fungicides, two with synthetic fungicides, two with biofungicides, and one non-treated control. The grapes were crushed and pressed immediately after the 2021 harvest. Both free run and press fractions juice were racked into one gallon of glass carboys. The yeast EC-1118 was inoculated into the juice for alcoholic fermentation. During fermentation, the yeast population was enumerated every day, and Winescan was used to monitor the fermentation status, including glucose, fructose, pH, TA, ethanol, and volatile acidity. Fermentation was considered complete when the residual sugar was less than 2 g/L. Upon completion of fermentation, potassium metabisulfite was added to maintain 40 mg/L of free sulfur dioxide. The wines were stabilized at 2 °C and screened for faults by an expert sensory panel prior to bottling. The finished wine was also measured for aroma compounds by headspace solid-phase microextraction gas chromatography-mass spectrometry (HS-SPME-GC-MS).

Chardonnay berries sprayed with the biofungicide showed normal fermentation. All wines made from biofungicide-treated berries had a similar chemical composition profile to the control wine. The range of alcohol content is 12%-13%. Residual sugar and volatile acidity were lower than 2g/L and 0.5g/L, respectively. The pH was maintained at 3.2-3.3, and TA at 7.6-8.2 g/L. There was no significant difference in aroma compounds such as linalool, beta-damascenone, 3-hexen-1-ol, isoamyl hexanoate, 1- octanol, 1-nonanol, and methyl salicylate among treatments. This study indicated that biofungicides may be used as an alternative to synthetic fungicides for Chardonnay wine.

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Political Science

An evaluation of the impact of the CITES agreement on the trade of hammerhead sharks and their populations

The Convention on International Trade on Wild Flora and Fauna (CITES) is an international environmental policy enacted in 1973 to ensure the survival of numerous species of plants and animals endangered by trade. Among the listed species, the number of endangered shark species increases within the agreement by every few years. Hammerhead sharks, particularly three species: the smooth hammerhead shark, the scalloped hammerhead shark, and the great hammerhead shark, are among the most traded for their oil, meat, and their most invaluable asset, their fins. The inclusion of these species into Appendix II of the CITES agreement in 2014 enables trade to commence through issued permits. However, studies have shown that the numbers of the abovementioned hammerhead sharks post the inclusion of the species within the agreement, are still in a rapid decline, and has fallen into the critically endangered category. This study aims to examine the effectiveness of the implementation of the CITES agreement regarding hammerhead sharks included within Appendix II post 2014. Methods employed are mixed with the use of secondary data analysis using the CITES public trade database alongside cross tabulation analysis of the amount and purposes of the trades and most traded body parts of the species, especially the fins. To further analyze the results, descriptive statistics in the usage of central tendencies provides a directional representation in the overall estimated population distribution of hammerhead sharks. Lastly, chi-squares will be used to demonstrate statistical significance of the results. Results are expected to show a decrease in the hammerhead shark population in global trends and a slight decline in hammerhead shark trade, which could be seen as an insignificant impact of the CITES agreement.

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Chemistry and Biochemistry

Synthesis of Boronic Ester Precursor for Suzuki Coupling as Anticancer Agents

Natural products have been long utilized in therapeutic applications for various diseases in traditional medicine. Currently, treatment options for newly emerging evolutions prove to be resistant to more advanced variants like that of metastatic cancer, which displays the urgent need for more advanced treatments. Bis-Piperidine Alkaloids are a group of marine natural products that have demonstrated selective and low micromolar antiproliferative potency towards leukemia, melanoma, and breast cancer. To further study this class of lead marine sponges, a library of tetracyclic bis-piperidine alkaloids with specific embedded functional groups were schemed to ease the synthesis and enhance their antiproliferative potency. A set of cross-coupling reactions were schemed to be prepared from an boronic ester and iodoenamine intermediates which have been derived from the piperidine moiety. The further study of the boronic ester intermediate will be achieved through an eight step synthesis characterized by ^1H NMR, ^{13}C NMR, and IR.

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Accountancy

Closing the Knowledge Gap: Reluctance in the Accounting Industry to Engage in the Blockchain Market

The invention of Bitcoin in 2008 sparked the rapid growth of the disruptive world of blockchain technology, a digitally decentralized system that sought to increase transparency and shift power on a global scale. In addition to the public's growing interest in digital assets on the blockchain, a lack of regulation and administration over this obscure software has slowly resulted in a knowledge gap between accounting professionals and this emerging industry. Our study targeted accounting professionals within the Central Valley to determine their firms' level of engagement with clients interacting in the blockchain market. Respondents were also invited to diagnose the barriers less experienced firms may face, in addition to identifying potential opportunities to overcome existing boundaries. Our results not only suggested a hesitancy by local accounting firms to accept audit and tax clients, but also hesitancy of the accounting professionals themselves. Our research suggests this is likely a result of the difficulties of developing an understanding of blockchain, as well as the high risk of applying this knowledge incorrectly. We have ultimately concluded that local accounting firms should begin training, implementing software, and gradually take on blockchain clientele if they wish to remain competitive in the evolving accounting industry.

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Chemistry and Biochemistry

Biomimetic Synthesis of Intermediates Towards Tetracyclic Bis-Piperidine Alkaloids

Cancer is the second leading cause of death in the United States and worldwide. Among the pharmaceutical drugs utilized in cancer treatments, over sixty percent are mimics or derivatives of natural products which have been demonstrated to exhibit a wide range of pharmacological activities. Natural products are typically isolated from various plant sources and, in particular, tetracyclic bis-piperidine alkaloids extracted from marine sponge *Neopetrosia proxima* have been shown to display significant cytotoxic effects against leukemia, melanoma, fibrosarcoma, colon, and breast cancer cell lines and repress cell proliferation. However, there are few studies concerning the total synthesis of bis-piperidine alkaloids and their structure-activity relationships due to their chemical complexity. In the Course-Based Undergraduate Research Experience (C.U.R.E.) module of the second semester of organic chemistry lab, we were introduced to research in the field of natural product synthetic medicinal organic chemistry through the synthesis of intermediates towards tetracyclic bis-piperidine alkaloids that have the potential to inhibit growth of specific cancer cell lines such as leukemia and breast cancer. Among lead compounds, 2-methylbut-3-yn-2-ol was chosen for its commercial availability and synthetic capability. Five compounds towards the critical intermediate have been synthesized: 2-yn-1-ol acetate (characterized by IR and ¹H NMR), N-(1,1-dimethyl-2-propyn-1-yl) benzenemethanamine (characterized by ¹H and ¹³C NMR), Methyl-[(1,1-dimethyl-2-propyn-1-yl)(phenylmethyl)amino]-2-propenoate (characterized by ¹H and ¹³C NMR), and two Mono-BOC-diamino compounds (characterized by ¹H NMR). Two ongoing syntheses include: closing the carboxylate portion of the previously synthesized benzenemethanamine to form a pyridine ring compound and then adding the two diamino compounds to the nitrogen of the pyridine group separately.

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Nursing

COVID-19 AND STILLBIRTH: WHY NOW IS THE TIME TO START COUNTING

Conflicting reports continue to emerge about the effects of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) on adverse perinatal outcomes. Despite the increasing number of published studies on COVID-19 in pregnancy, there are insufficient quality data to draw unbiased conclusions about the severity of the disease or specific complications of COVID-19 in pregnant women. To date, studies assessing whether COVID-19 during pregnancy is associated with an increased risk for stillbirth yield mixed results. The objective of this study was to evaluate the trend of stillbirth and COVID-19 in pregnant women during the COVID-19 pandemic. Retrospective chart reviews examining the number of stillbirths and COVID-19 infections among pregnant women hospitalized at two central California hospitals from March 2020 and March 2022 were performed. The data collected was compared to the national stillbirth rate available via the CDC's Wide-ranging Online Data for Epidemiologic Research (WONDER). Results are pending final completion of the project.

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Chemistry

Inhibitory effects of non caloric artificial sweetener sucralose on sucrose metabolism in *Saccharomyces cerevisiae*

Sucralose is a sugar substitute which is commercially used as a non caloric artificial sweetener (NAS). However, sucralose is suspected to diminish sucrose metabolism due to its inhibitory effects on the enzyme sucrose invertase. The goal of this project was to determine the extent to which the presence of sucralose inhibits sucrose metabolism. *Saccharomyces cerevisiae* (baker's yeast) strain W303 was selected for the experimental model due to its ability to metabolize sucrose. Manual growth curves were made over periods of 24 hours by using a spectrophotometer to measure the optical density of cultures of yeast made in synthetic complete media. The concentration of sucrose and sucralose in these media ranged from 0-2% in increments of 0.5%, such that when the concentration of sucrose was below 2%, the deficit was substituted with sucralose. The data obtained from these trials did not indicate that sucralose had a significant effect on the exponential growth rate of yeast in sucrose when compared to the control. However, in the presence of sucralose and excess sucrose, there did appear to be a significant reduction in the total number of cells which were grown in each culture. Specifically, a 9.6% reduction of total cells was found in a culture containing 1.5% sucrose and 0.5% sucralose as compared to a control which contained 1.5% sucrose in the absence of sucralose. Similar results were found in any culture which contained $\geq 1\%$ sucrose. This may indicate that the inhibitory effects of sucralose are more prominent when the yeast are grown in the presence of an excess of sucrose; a condition for which yeast carbohydrate metabolism is mostly sustained by alcoholic fermentation.

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Nursing

Validating stroke Loteria cards to educate Hispanic farmworkers attending a community migrant program on prevention, risk factors, symptoms, and appropriate response to stroke

Farmworkers face more significant health inequalities when compared to workers not employed in agriculture. The inability to access resources such as health education is one of these health disparities among farmworkers living in the United States (Harwell et al., 2022). This pilot study validated stroke Loteria as an education program designed to raise awareness of stroke prevention, risk factors, signs, and the appropriate response among Fresno County of California Hispanic farmworkers (HFW). Fresno County is one of three counties with the greatest number of farmworkers in California (Rogers & Buttice, 2013). Health Rural Women's Health Project and Farmworker Justice (2021) used the Loteria game to educate farmworkers on COVID. Loteria (bingo) is a popular cultural game in Latin America (Garcia, 2020). Using convenience sampling, 45 to 60 Spanish-speaking HFW volunteers living in Fresno County over 18 were recruited. The goal is to assess whether or not the Stroke Loteria can be used as an effective stroke education tool tailored for the HFW community. This pilot study can not only potentially lead to stroke awareness among the participants, but it can also lead to the development of a stroke education tool and provide greater insight into designing health education material tailored for HFW. The minimal risk includes emotional distress.

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Construction Management

Design comprehension & decision-making facilitated by a mixed reality environment

Technological innovations like virtual reality (VR) and augmented reality (AR) have been successfully implemented into training and learning programs to design unique learning experiences in virtual learning simulations. This is to help speed up the development of occupational competence, which typically requires years of apprenticeship training and experience.

The construction industry is surging at an alarming pace and technology plays a major role in that development. The short-term aspect of this study focuses on volunteer performance whereas the long-term objective of this study is to determine whether HoloLens 2 will be a sustainable alternative in the future in terms of price, time, user-friendliness, and safety. Research on the use of HoloLens 2 as a design review and modification tool in construction can bring significant benefits in terms of improved visualization, collaboration, design modification, and safety.

This research will focus on how the students will use the Microsoft HoloLens 2 in design review and design modification using a playhouse prototype. Students who volunteered in this research get to work on a playhouse that has been constructed in the virtual world which is represented as a 3D mockup in the Mixed Reality (MR) environment. They will review and modify the playhouse so it will be a better experience for kids who will play in the playground, but the students have to consider factors such as safety, sustainability, fun, cost & time. The changes that students make will be recorded and analyzed.

Using technology such as HoloLens 2 may have adverse effects on the human body, this will also be a key factor in consideration for this research. Surveys and Interviews undertaken will also help us understand the crucial areas of this research.

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Chemistry and Biochemistry

Metabolomics of the effect of a novel long-term storage of fruits using the RipeLocker® technology:: A preliminary NMR evaluation in pomegranates

The 'pomegranates' harvest season in California lasts up to 2-3 months. Consequently, a corporation's high demand for storage conditions would allow for the quality preservation of pomegranates for the entirety of the market year. Such a need questions the extent of product loss due to decay and physiological disorders induced by prolonged storage. RipeLocker® (RL), an AgTech company, has developed trademarked vacuum chambers with controlled environmental conditions to preserve the quality of perishables. In the current project, pomegranates supplied by RL from two sites, RLA and RLB, stored under hypobaric conditions were assessed along with control pomegranates stored in modified atmosphere packaging (MAP). The metabolomic changes in the exocarp, mesocarp, and arils of 15 stored fruit samples were analyzed using ¹H NMR spectroscopy, consisting of five replicates of the groups mentioned. A total of 20 metabolites were identified in aril tissue, and 18 were identified in the mesocarp and exocarp with NMR spectroscopy. Distinguishable differences between the MAP control and the new vacuum treatment were observed, as well as notable differences between the two sites. Among the many differences observed, a sucrose-derivative concentration was up-accumulated in the control aril samples compared to those stored in RipeLockers. Some sucrose derivatives are known for their role in pomegranate longevity, yet NMR has not been utilized before to assess their reaction to variable storage conditions in pomegranate. The up-accumulation of the sucrose derivative in the control samples suggests that this compound may serve as a potential biomarker of desiccation exposure under traditional storage conditions. By extending the use of NMR in plant metabolomics, the work presented aims to provide guidelines for pomegranate storage that ensure the maintenance of the quality and nutritional value of the fruit. This study shows promise for using NMR as a qualitative assessment tool for variable storage conditions.

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Nursing

Diabetes Specialty Clinic helping patients met their A1C goals

Introduction:

Diabetes is a chronic condition which affects millions of people globally and requires continuous monitoring and medical interventions. A1C's are used to assess the glycemic control of a person with diabetes. An elevated A1C level indicates poor glycemic control and can lead to various complications associated with diabetes, including cardiovascular diseases, neuropathy, and renal failure. The American Diabetes Association (ADA), set the standard of A1C's less than 7 mg/dL for patients with diabetes to reduce the risk of diabetic complications, and improve overall health. The purpose of this study is to assess if a diabetes specialty clinic can help patients achieve the recommended target treatment goal set by the ADA.

Research Method:

A retrospective chart review at Kaweah Health Chronic Disease Clinic in Visalia, CA, from 2020 to 2022. Data gathered from patients' initial visit with their A1C drawn to follow up A1C. Inclusion criteria individuals with type 2 diabetics, the initial visit started in 2020, and follow-up lab drawn before 2023, 18 years of age or older. Exclusion criteria are patients younger than 18 years old, patients who only had the initial visit, and no follow-up.

Results:

Patients attending the diabetes clinic reduced their A1C with follow-up visits. The average A1C at the first clinic visit was 8.0. Follow-up visit average A1C was 7.6. The study results showed that the clinic could reduce patients' A1C but patients were still not reaching the American Diabetes Associated treatment goal of A1C less than 7.

Conclusion:

This study showed the benefits of what a diabetic specialty clinic can offer for type 2 diabetic patients. That reinforcement of lifestyle changes, diet, exercise, and medication regimen can help patients reduce their A1C. While the follow-up visit did not result in patients being below 7, there still was a reduction in the lab value.

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Biology

Central California's Checker Lilies: Exploring the Diversity of Fritillaria Species through Population Genetics

This project aims to evaluate how many species/taxa are actually in the group of Fritillaria populations in Central California (currently classified as Fritillaria atropurpurea and Fritillaria pinetorum) through genetic and morphological data from a broad geographical survey of populations. Fritillaria is a plant genus in the Liliaceae (lily) family, and these two species are native California wildflowers. Fritillaria pinetorum is a rare plant that is endemic to the shady mountain forests found in high elevations around 3,000 meters in the Sierra Nevada Mountains, while F. atropurpurea has a much larger geographical range. Both species F. atropurpurea and F. pinetorum appear to be phenotypically very similar aside from slight and inconsistent morphological differences, but are currently listed as two different species. Both species are generally found in different but contiguous parts of California, overlapping in the central Sierra Nevada region. Due to the large size of the nuclear genome in this group, chloroplast DNA has been utilized to answer our question. The chloroplast region psbA-trnH has amplified well for all Central California species of Fritillaria such as F. atropurpurea, F. pinetorum, F. agrestis, and F. micrantha and has been sequenced and analyzed thus far. Resulting data have revealed an indel within the base pair range of #359-364, characterizing all F. pinetorum and one population of F. atropurpurea. A phylogenetic tree was created to show the relationship between the Central California Fritillaria species. Further genotyping with chloroplast microsatellites is underway to distinguish and determine the number of Fritillaria taxa in the Central California region.

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Biology

Where the Pigweed Grows: A population genetics approach to tracing the Californian invasion of Palmer amaranth (*Amaranthus palmeri*)

Palmer amaranth (*Amaranthus palmeri*) is a summer annual native to parts of the Southwestern United States and northern Mexico. Yet, over the past two decades, it has become one of the most extensive agricultural threats in the Southeast, parts of the Midwest, and more recently in Central California. Adaptive traits, such as herbicide resistance, have aided it becoming an extremely opportunistic plant in various agronomic settings. As part of a larger population genetic investigation, the aim of this study is to elucidate the origins of the Central California populations with the use of population genetic analysis. Neutral markers and adaptive herbicide resistance genes will be used to explore genetic clustering of Central California populations relative to native and nonnative populations in other parts of the U.S. Support for different invasion scenarios will be evaluated via analysis of single nucleotide polymorphisms (SNPs) using genetic clustering programs and approximate Bayesian computation (ABC). In addition, selection analysis of SNP data from California populations will be used to screen for overlap in outliers possibly linked to adaptation. Results from raw sequenced data carried out at the DNA Technologies and Expression Analysis Core at the UC Davis Genome Center revealed roughly 840,983,496 total sequences and generally good quality scores for a total of 167 samples in 17 populations from the Central California, Southeastern and Midwestern U.S. introduced ranges. Data is currently being mapped to a draft genome with the Burrows-Wheeler Aligner (BWA). Ongoing genetic analysis using clustering algorithms (ADMIXTURE, STRUCTURE, and adegenet's implementation of discriminant analysis of principal component DAPC) may further suggest possible invasion scenarios of California populations and identify genes involved in adaptation. Final results have the potential to facilitate future research identifying other weedy source populations, alternative strategies for more sustainable agronomic practices, and creating models for evolutionary adaptation in weedy plants.

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Anthropology

Preferred information sources Fresno State students use when making food choices and preparation decisions

How do we make decisions on what to eat? This project examines the relationship between students' information seeking behaviors and their food choices. Specifically, how do Fresno State students find nutrition and cooking information and how does that affect their food and food preparation decisions? The objectives for this study seek to explore when people do have access to fresh food and time to cook it, how do they decide what to cook? The study was conducted using a mixed-method study design with quantitative and qualitative data collected concurrently. Quantitative data was collected using survey flyers with a web link and QR code to an online Qualtrics survey, and an opt-in interview to get a greater understanding of a student's viewpoint about their food and preparation knowledge in relation to information sources. The flyer distribution consisted of posting the flyers around campus, in the Student Pantry and Health Center campus, and sent via sent to students by several colleges. Qualitative data was collected by randomly sampling participants from the quantitative data for in-depth interviews, and utilizing self-described internet use as low, medium, or high. Given the demographic population of Fresno State, the goal is to have the interview participant demographic ratios similar to that of the University. Based on preliminary findings, there is a noticeable percentage of students that prefer social media sources over traditional sources (family or cookbooks) when making food or preparation choices. The results of the study will be shared with the Student Pantry and Health Center to assist with helping target messaging to the student population.

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Kinesiology - Sport Psychology

**STATE SPORT-CONFIDENCE, SELF-EFFICACY, AND SHOOTING ACCURACY
FOLLOWING A BRIEF MENTAL SKILLS TRAINING INTERVENTION WITH FEMALE D1
WATER POLO PLAYERS**

The purpose of the proposed study is to investigate the effects of implementing a 3-week curriculum around mental skills training (i.e., self-talk, imagery, relaxation/arousal control; UNIFORM; Gilbert, 2011) on sport self-confidence, self-efficacy, and shooting accuracy on a 5-meter performance task. Two Division I water polo programs minimum will be randomly selected to serve as intervention groups after expressing interest in the study. Both groups will complete the 5-meter performance task and the survey instruments pre-intervention (T1) and post-intervention (T2). The instruments used to assess self-efficacy, sport self-confidence, and mental skills include the 5-Meter Shooting Efficacy Questionnaire (5-MSEQ) adapted from the Free-Throw Shooting Questionnaire (FTSQ; Byrd, 1997), the State Sport-Confidence Inventory (SSCI; Vealey, 1984), and subscales of the Ottawa Mental Skills Assessment Tool-3 (OMSAT-3; Durand-Bush et al., 2001) combined with selected subscales of the Test of Performance Strategies (TOPS; Thomas et al., 2008). There are three main hypotheses for this study. The first, athletes will increase their shooting accuracy on the 5-meter performance task and 5-MSEQ scores from T1 to T2. Second is that athletes in the experimental group will have higher OMSAT-3/TOPS scores than the control group in the second measurement. In two segments, the third is that athletes in the experimental group will report a positively correlated score between SSCI scores and OMSAT-3/TOPS scores. OMSAT-3/TOPS scores and SSCI scores for all athletes will have a stronger positive correlation in the T2 measure than in the T1 measure. Data analysis will include a one-way ANOVA, a regression between the experimental and control group to measure if the mental skills training intervention impacted the participants' scores on the performance task, 5-MSEQ, SSCI, and OMSAT-3/TOPS. A series of correlations will be run between participants' responses on each instrument (excluding the demographic survey) and the scoring percentage on the 5-meter performance task.

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Family Nurse Practitioner MSN

Vaccination Among The Hispanic Population

California's Department of Public Health data shows us that 56% of the Hispanic population is vaccinated compared to Whites at 72% and Asians at 79%. Hispanic vaccination rate percentages are 16% less than whites and 23% less than Asian populations (California Department of Public Health, 2022). This data is similar between counties in California as well. According to the Tulare County Department of Public Health, the vaccination rate for the Hispanic Population in Tulare County is 56% compared to Fresno counties 64% (CHDP, 2022). This is leading to increased hospitalizations, complications, and deaths among the Hispanic population. This study will use a questionnaire that has been used in 17 different countries to identify vaccination hesitancy barriers. The study will be conducted over the span of 2 months and aims at exploring knowledge, vaccination beliefs, and vaccination barriers among the Hispanic population in Tulare, County. Questionnaires will be collected from voluntary participants at Tipton Medical Clinic. Hispanic patients that meet the inclusion criteria will be given the opportunity to participate in our questionnaire. The purpose of my study is to increase vaccination rates and address vaccination hesitancy among the Hispanic population in Tulare County. Once barriers are specifically identified, then appropriate educational tools can be implemented to address those barriers, and hopefully increase the COVID-19 vaccination rates in the Hispanic Population in Tulare County. This study will be taking place from January-March 2023. Results are still pending currently.

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Serendipitous Identification Of A Noxo1 Inhibitor By Addition Of A Polyethylene Glycol Chain

Reactive oxygen species (ROS) are a heterogeneous group of highly reactive ions and molecules derived from molecular oxygen (O₂), which can cause DNA damage and lead to skin cancer. NADPH oxidase 1 (Nox1) is a major producer of ROS in the skin upon exposure to ultraviolet light. Functionally, Nox1 forms a holoenzyme complex that generates two superoxide molecules and reduces NADPH. The signaling activation occurs when the organizer subunit Noxo1 translocates to the plasma membrane bringing a cytochrome p450 through interaction with Cyba. We propose to design inhibitors that prevent Cyba-Noxo1 binding as a topical application to reduce UV-generated ROS in human skin cells. Design started from an apocynin backbone structure to generate a small molecule to serve as an anchor point, inhibitor 1, followed by adding a polyethylene glycol-linked biotin in inhibitor 2. Both inhibitors were found to be non-toxic in human keratinocyte cells. Further in vitro experiments using isothermal calorimetric binding quantification showed that inhibitor 2 bound a Noxo1 peptide with a KD of 2nM. Both isothermal calorimetric binding and MALDI (TOF) MS showed that the binding of a Cyba peptide to Noxo1 was blocked. In vivo experiments were performed using donated skin explants with topical application of the two inhibitors. Experiments show that ultraviolet light exposure inhibitor 2 reduced the amount of cyclobutene pyrimidine dimers in DNA, a molecule known to lead to carcinogenesis. Further synthesis showed that the polyethylene glycol but not the biotin was essential for inhibition.

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Mathematics

A User-User Recommendation System and Deep Learning Approach for Epistasis Detection

Mutations are changes to DNA, the biological blueprint of all humans. Mutations are the cause of many evolutionarily beneficial traits and devastating illnesses. One specific type of mutation is called a single nucleotide polymorphism, or SNP. Sometimes, SNPs interact with each other and may affect phenotypes. Such interaction of multiple SNPs is known as epistasis. Epistasis is ubiquitous in human disease, and it has been implicated in diabetes, bipolar disorder, atrial fibrillation, and many other health concerns. Accurately deciphering the epistatic interactions of SNPs is crucial to understanding their role in disease. Unfortunately, many of the current statistical methods for detecting epistasis are computationally expensive as they rely upon analyzing an exponential number of combinations of SNPs. Furthermore, these methods are not entirely accurate as they are prone to false positive results. Our research tackles these two shortcomings by reducing the number of SNPs to test for statistical significance to only those most likely to be involved in the development of a phenotype. We accomplished this using a type of artificial intelligence called neural networks and user-user recommendation systems. We tested our method on both real and simulated data. Our method achieved a one-hundred percent accuracy at detecting epistasis in all six simulated datasets. Furthermore, we were able to detect epistasis in three out of four of the real datasets. However, the small size of the real datasets warrants further investigation. Nevertheless, our method shows promise in detecting epistasis with greater computational efficiency and fewer false positives than traditional methods.

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Public Health

Non-Alcoholic Fatty Liver Disease Self-Management Among the Hispanic/Latino Community

Objective: This study examined the association between dietary and exercise behaviors and factors among Hispanic/Latino patients with Non-alcoholic Fatty Liver Disease (NAFLD) to inform future tailored NAFLD lifestyle interventions.

Methods: Data were collected using a 54-item Qualtrics survey. Interviews lasted between 10 to 20 minutes with Hispanic/Latino patients diagnosed with NAFLD at Fresno Clinical Research Center (FCRC). SPSS software was used to perform a multivariate linear regression analysis to assess the significance and directionality of relationships between dietary and exercise behaviors and substance use, knowledge, familism, acculturation, demographic characteristics, and disease severity characteristics among participants.

Results: Demographic data showed that the average age of participants was 53 years old. 74.5% of participants self-identified as Mexican. 68.1% self-identified as female. 55.3% self-identified as married. 80.9% of participants had an annual income of at least \$35,000. 45.8% of participants had at least a Bachelor's degree. 21.3% of participants were unemployed. Exercise analysis indicated four predictors, 'Age' $B=.038$, 95% CI I [.015, .061], 'Gender (Female)' $B=-.750$, 95% CI I [-1.36, -.140], 'Knowledge that diabetes causes fatty liver' $B=-1.56$, $p=.059$, 95% CI I [-2.82, -.304], 'Does not experience financial stress' $B=-.911$, 95% CI I [-.271, 2.32]. Diet analysis indicated one predictor, 'Knowledge of alcohol as a cause of liver cirrhosis' $B=2.70$, $p=.059$, 95% CI I [-.102, 5.50].

Conclusion: Higher knowledge of alcohol as a cause of liver cirrhosis was associated with poorer dietary behaviors. Older age was associated with poorer exercise behaviors. Females demonstrated healthier exercise behaviors than males. Low financial stress and high knowledge that diabetes causes fatty liver was associated with healthier exercise behaviors. One could conclude that increased health education among Hispanics/Latinos with NAFLD may improve their diet and exercise behaviors. Further research is needed on how gender and financial stress affect exercise behaviors.

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Biology

Modeling Depression and the Effects of 5-HTP Using Learned Helplessness in *Drosophila melanogaster*

This study analyzed the impact of the 5-HTP, a serotonin precursor, on learned helplessness in *Drosophila melanogaster*, or the common fruit fly. Learned helplessness can be used to induce depression-like symptoms in flies; flies who show learned helplessness have reduced climbing and flying behaviors. The present study examined these symptoms in Berlin-K (wild-type) fruit flies when left untreated or with 5-HTP, a dietary supplement that aids in raising serotonin levels in the brain and helps boost mood and behavior.

This study was divided into two phases. In the first phase, a learned helplessness state was induced by using periodic vibrations with an orbital shaker at 300 rotations per minute. Flies were placed in individual vials; there was a control group that received no disturbance and a test group that experienced periodic rotations for 10 hours to induce a condition that they could not predict or control. Following this, the flies were allowed a resting period of 24 hours before their climbing behaviors were observed throughout a 120 second time period. Observations (n=60) showed that there was a moderately high relationship ($r=-0.63$) between the climbing behaviors of flies after they underwent learned helplessness.

The second phase of the study involved investigating the effectiveness of 5-HTP in reversing a learned helplessness state. Flies (N=200) in the control and learned helplessness group were treated with low, medium, and high doses of 5-HTP. The flies were monitored and data was collected similar to the previous phase. Preliminary results suggest that medium to high doses of 5-HTP may prove effective in reducing learned helplessness behaviors. The results of this study can be used to better understand depression and depression recovery in a model system and allow for rapid screening of new pharmacological interventions that can translate to humans.

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Psychology

Impact of Modern Day Media on Mental Health Professional Stereotypes and Help Seeking

There are many different barriers to mental health treatment that are prevalent in society today. Media is likely to have an important effect on attitudes towards help seeking. Movies about mental illness are likely to contain stereotypes about mental health professionals. Some movies portray mental health professionals in a positive light. However, few studies investigate how these portrayals affect stigma and attitudes toward help seeking. The present study tested the hypothesis that a movie in which a viewer observed a positive outcome of therapy with both positive and negative interactions with therapists would increase positive attitudes towards help seeking.

Participants in the study were recruited from the Introductory Psychology subject pool. Participants completed the informed consent process and then completed the Mental Health Seeking Attitudes Scale (MHSA). Then, participants watched the movie, *Good Will Hunting* (1997). After the movie, they answered the Movie Thoughts About Mental Health Professionals Scale (MTMHP) about their opinions of the mental health professionals in the movie and the MHSA for a second time. A multiple regression analysis was used to analyze the data. In the first analysis, preliminary results showed that the stereotypes of mental health professionals participants observed in the movie would mediate the relationship between scores on the MHSA before and after the movie.

The expected results will provide the foundation for further research on the effects of movie portrayals of therapists on attitudes towards help-seeking. The results will also have implications for mental health education-entertainment strategies designed to decrease attitudinal barriers towards help-seeking.

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Biology

Exploring the Effects of the Proto-oncogene Bcl-2 on Metabolic Transitions in Brewer's Yeast (*Saccharomyces cerevisiae*)

Due to their use as biological models and their potential for industrial application, microorganisms such as bacteria and unicellular fungi are of great interest to researchers. From genetic engineering to drug development, determination of the growth rate of these organisms is often the foundation of many areas of microbiological research. The most common method used to calculate the growth rate of microorganisms is to measure the optical density of cells at 600 nm (OD 600) using a traditional UV-Vis spectrophotometer. If the OD 600 is proportional to the number of cells in solution at a given time, it stands to reason that monitoring this value as the cells grow can be used to estimate how quickly they are dividing. Despite being the gold-standard method for assessing microbial growth, measuring the OD 600 in this manner has several limitations. For example, manual collection of absorbance data removes the cell culture from optimal growing conditions for the duration of the collection period, which may impede cell growth. Furthermore, this method has considerable logistics concerns, as data collection can take several hours with repeated measurements every 30-60 minutes. Here, we present a novel, high throughput approach to OD 600-based growth rate calculations using a 96-well plate format. The diploid *Saccharomyces cerevisiae* strain W303-2n was transformed to express *bcl-2*, a human proto-oncogene using the pCM184 shuttle plasmid. The growth rate of this mutant was compared to that of a vector control construct lacking the *bcl-2* transgene. In the 96-well plate format, the Bcl-2 expressing yeast displayed a significantly higher doubling time in the fermentative and oxidative phases of growth when compared to the control group. The data suggest that microplate spectrophotometry is an effective and reproducible method of determining the growth rate of microorganisms throughout different growing phases.

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Biology

Investigation of Brain Activity while Listening to Music using Brain Control Interface (BCI)

Music has a use in many different environments. What makes music interesting is that it has the ability to stimulate the brain to feel more relaxed, motivated, frightened, or excited. Music is significantly used in the media industry to set the right environment for a movie scene, whether that is a jump scare or an emotional one. Music is significantly involved in our lives but what types of electroencephalogram (EEG) patterns (e.g. alpha waves) emerge due to different types of music (e.g. relaxed or stimulatory) remains to be explored. Additionally, how brain alpha waves, which are associated with a relaxed state of mind, are affected by listening to relaxing or stimulatory music under cognitively demanding tasks, such as mazes or puzzles, remains to be tested. Therefore, the current study will investigate whether there is a significant relationship between relaxing and stimulating music and brain alpha waves during a cognitively demanding task. This will be investigated by assessing alpha waves through the use of electroencephalogram (EEG) recordings. We plan to make use of a brain computer interface (BCI) device specifically, Ganglion Board by OpenBCI company to conduct our experimentation and data gathering which will be presented in the research work.

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Construction Management

Redevelopment of Local Vacant Structures into Mixed-Use Development

Due to rising costs of living and lack of access to competitive wages, California is facing a major housing crisis. While the Bay Area and Southern California regions have already begun to take steps to address this crisis local to their respective regions, the Central Valley has the opportunity to learn from approaches developers in these regions have taken to address this issue and adjust them to fit the needs of the Central Valley. One such approach and potential solution to this crisis is the use of mixed-use development, which vertically combines residential and commercial space in a limited footprint. While the Central Valley does not face the same challenges with regard to shortage of space, it does tend to fall behind economically. Therefore, the concept of mixed-use development can be adapted to fit the needs of the region, specifically with regard to the conversion and redevelopment of existing abandoned structures throughout Fresno County.

This project explores the impact this type of development could have on the housing crisis local to the Fresno County area. With information from local jurisdictions regarding the quantities and types of abandoned structures largely in low-income and industrial areas paired with literature regarding the successes other communities have had with this approach, we can begin to assess and quantify that potential impact. The results of this study suggest that, in fact, mixed-use redevelopment of abandoned structures is a viable, effective and sustainable strategy to lessen the effects, if not mitigate the housing crisis locally.

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Chemistry and Biochemistry

The Effects of Neurotoxin β -methylamino-L-alanine (BMAA) on Protein Ubiquitination

Amyotrophic Lateral Sclerosis / Parkinson's Disease Complex (ALS/PDC) is a neurodegenerative disease that exhibits symptoms of ALS followed by those of PDC. Although rare, there have been reports of high incidence rates of the disease among the Chamorro people of Guam and residents of other areas such as West Paupa, the Kii Peninsula, and the Florida Coast. The people from these regions have been subjected to higher concentrations of the neurotoxin β -methylamino-L-alanine (BMAA), mainly sourced from their diets, which has been magnified by the food chain. When introduced to the body, BMAA binds to N-methyl-D-aspartate receptors, where it could contribute to selective motor neuron loss, activation of glutamate receptors, and induce oxidative stress. It had been found that BMAA interacts with proteins, causing misfolding and aggregation; it can become misincorporated into proteins, including the protein ubiquitin. As ALS is characterized by the aggregation of ubiquitinated proteins, this study will investigate the effects of BMAA on the protein ubiquitination pathway. This experiment is designed based on previous computational data that shows a covalent interaction between BMAA and ubiquitin. NT2 cells, a neuronal progenitor cell line, will be grown and subjected to various concentrations of BMAA. Once treated, the cells are lysed, and the extracted proteins will undergo a Molybdenum blue assay to look at the rate of protein ubiquitination.

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Chemistry and Biochemistry

Synthesis and Antiproliferative Evaluation of Licochalcone A analogs in Triple Negative Breast Cancer Models

There are approximately 290,560 estimated breast cancer cases in the United States as of 2022. Triple-Negative Breast Cancer (TNBC) accounts for about 15-20% of all breast cancer. TNBC has poor prognostics and is more aggressive since it lacks targeted therapeutics commonly found in breast cancer such as estrogen, progesterone, and human epidermal growth factor receptor (HER2). It is important to understand the difference in the types of cancer and why most options are not as efficient with this variation. This project's fundamental hypothesis is that substituting the hydroxyphenyl in licochalcone A with a 1-alkyl-1H-imidazol-2-yl will boost the anticancer potential. A group of 1-alkyl-1H-imidazol-2-yl has previously been established by Dr. Qiao-Hong Chen's research group as a good bioisostere for a substituted phenyl. The project will synthesize nine different target analogs and will be characterized by the use of NMR, IR, and HRMS. The antiproliferative activity will be compared to a positive control group, Taxol, on two different cancer cell lines, MDA-MB-231 and MDA-MB-468, on a WST-I cell proliferation assay.

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Prophylactic Antibiotic Use in Burn Patients

Background: Burns are one of the leading causes of accidental injuries with up to 12 million burn injuries occurring annually. The United States is responsible for 500,000 of these injuries. Infection is the second leading cause of mortality in burn patients. Multi-drug resistant (MDR) bacteria are of specific concern to the burn population, which can lead to empiric selection of antibiotics to target MDR bacteria. This can help give rise to antimicrobial resistant organisms. Although infection is of concern to burn patients, there is no evidence supporting the use of prophylactic antibiotics in burn management. Instead, use of antibiotics prophylactically in these patients results in increased antimicrobial resistance which is why the national guidelines do not recommend the use of prophylactic antibiotics in burn patients.

Objective: To assess if non-burn medical providers in the Central Valley are following national guidelines set by the American Burn Association by not prescribing prophylactic antibiotics to burn patients. The study will help indicate whether further research is needed for educating non-burn providers regarding management of minor burn injuries.

Methods: Charts of 54 patients seen from January 1, 2021 – December 31, 2021 were reviewed. All patients selected were managed by non-burn providers prior to their transfer to Leon S. Peters Burn Center at Community Regional Medical Center. Patients were randomly selected and included men and women between the ages of 18 and 65 years with second degree burns with less than 10% total body surface area involvement caused by a thermal injury.

Results: 54 patient charts were reviewed. 11 of the 54 patients received prophylactic antibiotics prior to their transfer to the burn center.

Conclusion: Data is being evaluated and conclusion will be complete prior to the conference.

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The Role of Release Month in the Reproductive Success in Hatchery Raised Chinook Salmon from the San Joaquin River

Pacific salmon populations have been declining for many reasons. The declines in California salmon have been especially severe. The construction of the Friant Dam on the San Joaquin River in 1942 led to the loss of the Chinook salmon population that migrated and spawned there annually. To mitigate this significant loss, the San Joaquin River Restoration Program was created in 2006 to determine the most effective way to re-introduce a self-sustaining Chinook population. One method to increase spawning rates in the river is to release hatchery-raised broodstock salmon at different times of the year, in both May and August. In order to determine which release month has higher spawning success rates, data from 2019 was collected and analyzed by looking at variables including the sex and age of the broodstock fish released. Spawning success as the number of offspring produced was estimated by genetic fingerprinting of offspring caught in rotary screw traps and by tracking the carcasses of the salmon after they spawned and looking for eggs in the females. These two methods were used to determine if the broodstock fish spawned. The results show that August-released salmon had higher spawning success when compared to May releases, especially in 3-year-old females and 4-year-old males. This may be due to the fact that May-released salmon had to endure the stress of warmer water in the summer before they eventually attempted to spawn in the fall.

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School Nurse Barriers Related to the Delivery of Healthy Eating and Activities Interventions to Students

Obesity is the most common nutrition problem faced by children in the U.S. Students in Fresno Unified experience higher rates of obesity and score lower on fitness testing than students in the neighboring districts. School Nurses are described as key advocates for students' weight-related health, yet the literature shows they experience numerous barriers when delivering these primary prevention interventions. This study aims to identify the most impactful barriers experienced by school nurses in Fresno Unified School District.

This mixed-methods study utilized a validated measure called the School Nurse Attitudes and Perceptions Tool [SNAP] to survey Fresno Unified School Nurses to quantify their barriers regarding the delivery of weight-related interventions to students. This survey was augmented by a five-person focus group consisting of 5 volunteers to explore concepts related to the survey.

A survey of 33 Fresno Unified school nurses revealed that their primary barriers are related to societal factors, knowledge/resources, and family characteristics. A five-person focus group discussion supported the data obtained through the survey with the most common themes referencing the sale of non-nutritious food items to students during the school day, the poor quality of school meals, and the presentation of school meals as processed, pre-packaged foods, reinforcing unhealthy habits

Fresno Unified students are struggling with overweight/obesity and are not meeting fitness standards. The SNAP survey and focus group determined the most impactful barriers experienced by school nurses. Mitigation strategies to offset these barriers should include the district-wide implementation of an evidence-based healthy eating and activities program, printed resource materials for families, education for nurses, and a paradigm shift in the kinds of food offered to students during the school day, including ending the practice of selling non-nutritious items to students in school snack bars.

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Biology

Investigating one carbon metabolic pathway in HER2-positive breast cancer

Breast cancer is one of the most common cancers for women in the United States affecting about 30% women yearly (American Cancer Society). And of that percentage, 15-20% are diagnosed with overexpression of Human epidermal growth factor 2 (HER2). Studies have shown that patients diagnosed with HER2 overexpression are also associated with poor survivability due to its aggressive growth and recurrence. Although there are current therapies targeted for women with HER2 breast cancer, they often develop drug resistance after multiple exposures to anti-HER2 therapies. Because of this continued resistance and growth, understanding the molecular mechanisms of breast cancer metabolism is key in identifying new strategies to target the disease. Previous research in our lab pointed towards a positive role of the glycine/serine/threonine metabolic pathway or one-carbon metabolism. It is used by cancer cells for the biosynthesis of nucleic acids, proteins and lipids. Allowing for high capacity cell growth and survivability. For this project we have a series of eight breast cancer cell lines with low, medium and high HER2 expression. Adapting each cell line for growth in two dimensional(2D) and three dimensional (3D) tissue culture to a common medium will facilitate evaluation of their HER2 expression by Western blot. In combination with high resolution one dimensional (1D) and two dimensional (2D) nuclear resonance spectroscopy (NMR) to further analyze metabolite changes to validate the role of one-carbon metabolism. Our current results demonstrate that extracted metabolites are stable and can be re-evaluated on different instruments. This approach allows for a better understanding of the global metabolic changes associated with HER2 positivity. These results are key in developing our understanding for potential biomarkers for metabolomic blockade that can be used in conjunction with current anti HER2 therapeutic strategies.

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Psychology

Cultural congruity and academic self-efficacy Among Latinx college students: Does familism impact this relationship?

Hispanic serving institutions (HSIs) attend to 54% of Latinx students. Research shows that Latinx students are more likely to attend an HSI based on their geographical location and cultural congruity being present. Cultural congruity refers to an institution of higher education that provides an environment where students feel comfortable and are represented within the curriculum and classrooms. Perceived cultural congruence is important because when students are engaged in academics that contain materials related to their home and community experiences, students are more likely to uphold their cultural identities and it is linked to greater academic achievement. Of interest is how cultural congruity is associated with students' confidence in their abilities to properly and successfully achieve academic responsibilities (ie. academic self-efficacy). While it is important to consider the direct relationship between cultural congruity and achievement-related outcomes, it is worthwhile to consider additional factors of interest. For example, current literature states that presence of familism, which is having strong and supportive relationships with family members, is associated with greater academic efforts and is generally perceived as a moderator. The purpose of the current study is to examine the relationship between cultural congruence among Latinx college students and its association to academic self-efficacy and the influence of cultural values within this relationship. It is expected that cultural congruence will be associated with higher academic self-efficacy and cultural values will amplify this association.

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Agricultural Business

California Pesticide Regulation: Public Policy and Economic Forecasting

California hosts the most restrictive array of pesticide use regulation legislation in the nation while still maintaining their position as the largest pesticide using state. The purpose of this research is to examine California's recent pesticide regulation legislation and its effect on pesticide usage, economic revenue, and agricultural enterprises. Our research includes building a comprehensive background on the evolution of pesticide use reporting, the economic impact of selling and regulating pesticides within California, and recent fumigant restrictions. Utilizing both pesticide use reports from the California Department of Pesticide Regulation and an array of recent regulatory legislation will build a holistic picture of how regulatory policy affects both the California agricultural economy and domestic consumers. A specific case study on 1,3-dichloropropene (1,3-D), a pesticide fumigant that rose in popularity due to the regulation of methyl bromide, demonstrates the importance of accurately forecasting pesticide use and possible alternatives. The case study on 1,3-D demonstrates that there are various approaches towards regulating fumigants, but all include economic repercussions for both pesticide producers and agricultural consumers. Additionally, the case study exhibits a path for California policymakers to make considerable progress towards the Sustainable Pest management Roadmap for California 2050 which aims to eliminate or significantly reduce the use of pesticides in California by 2050. Further, this study creates a base to evaluate the relationship between policy and pesticide use through a decision making lens so that actors can make well informed decisions regarding regulatory policy that has environmental, social, and economic repercussions.

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Chemistry and Biochemistry

Antifungal Drug Discovery Through Synthesis and Biological Evaluation of Small Novel Organic Molecules

Fungal infections continue to threaten millions of people yearly and are constantly overlooked. Recent discoveries and publications suggest that fungal infections could increase in prevalence in the coming years. Currently, only four classes of antifungal agents are used to fight this growing trend: allylamines, echinocandins, polyenes, and azoles. The prolonged and improper treatment with these compounds has led to antifungal resistance. This leads to the threat of more severe fungal infections because the efficacy of the limited antifungal drugs has decreased. There is an even more severe risk for those working in the agriculture industry, which is very prevalent in the California Central Valley. People working in the agriculture setting have increased drug resistance caused by recurring exposure to antimycotic agents. As current antifungal agents begin to falter, mortality from life-threatening fungal infections continues to rise. The time to develop novel safe and effective antifungal drugs is right now.

Our research lab has begun work on a new generation of compounds that aim to combat this future public health emergency. The antifungal research team is pursuing a minimalist medicinal chemistry approach via structure-activity-relationship (SAR) studies beginning at known antifungal drug platforms. The structural inspirations came primarily from Clotrimazole and Fluconazole, the two lead antifungal drugs with known drawbacks. Additionally, our research group had previous synthetic experience and expertise with clotrimazole-like compounds for a different project. The relentless learning process with noteworthy contributions from our master's student, has emphasized the importance of azole moieties in antifungal agents. This learning and realization led to some reinvention of the fundamental design aspects. Dr. Alija Mujic, our collaborator, has been instrumental in training our research group on the screening protocols against the fungal growth of *Aspergillus flavus*. This presentation will describe the continuous research efforts on conquering the synthetic challenges and establishing the antifungal assays.

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Library

Breathing Life Into Learning About Air Quality: Developing and Implementing Environmental Health Outreach With High School Students

The San Joaquin Valley is comprised of diverse populations that as a whole are medically underserved and experience significant air pollution. Two-hour interactive outreach sessions were provided at three local high schools in Fresno and Madera to students in health careers pathways. Librarians and student doctors from a local osteopathic medical school guided high school students in health professions pathways through activities to understand the causes of poor air quality in the San Joaquin Valley; describe the different parts of the respiratory system and how air pollutants impact it; identify steps they can take to monitor the air quality and adjust their activities to protect their health; how zip code is a fairly accurate predictor of health; and access National Library of Medicine resources for reliable health information. A comparison of pre and post surveys showed a large improvement in an understanding of what the air quality index (AQI) is, how air pollutants impact different body systems, and lifestyle modifications to reduce the health impacts of air pollution. Outreach sessions to high school students can be effective in increasing knowledge of environmental health issues.

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EXAMINATION ON THE UTILIZATION OF LONG-ACTING REVERSIBLE CONTRACEPTION (LARC) IN A RURAL REPRODUCTIVE HEALTH CENTER IN COMPARISON TO NATIONAL AVERAGES

This study examined the utilization rates of Long-acting reversible contraception (LARC) among females in a rural reproductive health center in central California. An internal quantitative, retrospective chart review was performed to include the six-month period from June 1st, 2021, through December 1st, 2021. The aim of the study was to identify possible LARC uptake deficiencies among patients in this small rural reproductive health center, by comparing them to national averages. In order to decrease missed LARC education incidences, an interventional electronic health record (EHR) LARC educational pop-up reminder for providers was suggested. Unplanned and untimed pregnancies continue to be a public health concern for individuals in our communities, across the country, and around the world. LARC has been identified as a successful and reliable method of planification that can assist individuals in postponing and planning their pregnancies without interruption. Discovering LARC uptake deficiencies in our medical health centers can help improve utilization rates by targeting LARC education, and furthermore, decrease unplanned pregnancy rates. It was hypothesized that the utilization rates of LARC use among female patients seeking contraction from this local rural reproductive health center in central California would be lower than the national average rates.

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Acute management of hypertriglyceridemia with a disease specific intravenous insulin infusion order set

Introduction: Hypertriglyceridemia associated acute pancreatitis is a disease lacking a standardized management approach. The objective of this study was to evaluate the safety and efficacy of a continuous intravenous insulin infusion order set specifically designed for managing hypertriglyceridemia.

Methods: This study compared the safety and efficacy of a standardized (post-intervention) approach to managing hypertriglyceridemia to a non-standardized (pre-intervention) approach. The primary efficacy outcome was the percentage of patients who achieved a triglyceride level less than 500 mg/dL. Additional outcomes included the time to achieving a triglyceride level less than 500 mg/dL and the percent reduction in triglyceride levels. The primary safety outcome was the number of patients who experienced hypoglycemia (glucose less than 70 mg/dL).

Results: Twenty patients were included in both the pre- and post-intervention groups. There was a significantly greater reduction in triglyceride levels observed in the post-intervention group. The number of patients who achieved a triglyceride level less than 500 mg/dL in the pre- and post-intervention groups were 10 (50%) and 17 (85%), respectively, $p = 0.018$. Within the post-intervention group, the time to achieving a triglyceride level less than 500 mg/dL in those with and without diabetes was 56.8 hours (38.2-64.0) vs 27.6 hours (19.7-45.0), respectively, $p = 0.028$.

Conclusion: Our findings demonstrate that insulin infusions are safe and effective when therapy is standardized and accounts for nursing to patient ratios. Our results provide the medical community with a standardized approach to acutely managing hypertriglyceridemia.

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Biology

A meta-analysis of cytokine/chemokine profiles induced by SARS CoV-2 and other viral infections

Cytokines and chemokines are small protein molecules released to assist in many biological activities such as intercellular signaling, cell proliferation & differentiation, endocrine activities, and inflammation. In particular, they play an important role in activating the host immune response to viral and bacterial infections. The immune response mediated by cytokines is determined by a highly regulated and efficient cytokine production and a balance between pro-inflammatory and anti-inflammatory cytokines. However, an excessive or dysregulated production of cytokines – known as the cytokine storm has been observed in some instances – especially during the recent SARS CoV-2 (Covid-19) infection. Cytokine storm has been seen as a major driver of illness severity, thus associating it with increased morbidity and mortality in the novel SARS-CoV-2 viral infection.

This study utilizes meta-analysis bioinformatics tools to search two scientific databases PubMed and Luminex publications to collect data on different cytokines and chemokines measurements from existing studies on viruses. A preliminary analysis was conducted on three data sets of cytokine and chemokine profiles belonging to 3 viruses – Hantavirus, HIV-1, and Covid-19. These investigations suggest two notable results: (a) Cytokine/chemokine profiles are unique to a particular viral infection, and (b) IP-10 (Interferon gamma-induced protein 10) was excessively upregulated in some patients as compared to normal individuals, most notably in the case of Covid-19 infection.

The final analysis will curate ~200 data sets using R statistical software to investigate the upregulation and downregulation of cytokines and chemokines released in response to viral infections to understand the cytokine storm. Additionally, the cytokine profiles will be analyzed to establish an association between the types of viruses and the cytokine profiles released by them and develop an interactive network graph (interactome). These results will lead to a better understanding of the ambiguous dynamics of host immune response, possibly develop an interactive diagnostic/drug development tool, and improve various immune-modulating and immunosuppressive therapies used in various viral infections.

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Chemistry and Biochemistry

Developing an antibacterial wound dressing using pulsed and continuous 1,8-cineole plasma on commercially-available wound dressings

One of the leading causes of death is hospital-acquired infections (HAIs). According to Medicare data, HAIs estimate to cost anywhere from 28.1 to 96.8 billion dollars yearly. Most HAIs begin when bacteria attaches to the wound, but if left untreated, the infection site can become chronic. The existing clinical standards include topical and oral antibiotics. However, this can become problematic because of possible antibiotic resistance. Thus designing a wound dressing to actively kill bacteria on contact would be optimal for chronic wound treatment. Plasma-enhanced chemical vapor deposition (PECVD) using 1,8-cineole as the plasma feed gas has been shown to actively kill bacteria on glass slide surfaces. But 1,8-cineole-based PECVD strategies have not been extended to wound dressing materials.

The present study's goal is to use 1,8-cineole PECVD to modify commercially-available wound dressing materials (hydrofiber and hydropolymer). The strategy includes depositing a film with antibacterial properties using plasma treatment. It's possible to control the coating chemistry of the chosen materials by adjusting plasma parameters, but no attempt has been made to compare pulsing vs. continuous-wave deposition. Pulsing power can enable the plasma precursor's functional groups to be maintained to a greater degree when compared to continuous power. Since the functional groups give 1,8-cineole its antibacterial properties, we hypothesized that pulsing would enable the functional groups to be maintained upon PECVD. This research optimized plasma parameters ($P=20$ W, treatment time = 20 min) for both depositions. While the pulsed depositions utilized were 10%, 25%, and 50% duty cycles. X-ray photoelectron spectroscopy was used to determine the elemental composition, while water contact angle goniometry evaluated the changes in the surface wettability. To evaluate antibacterial properties against gram-positive and gram-negative bacteria zone of inhibition testing was performed. Overall, this study is progress towards directly targeting chronic wound infections.

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Chemistry and Biochemistry

Determining the antioxidant activity of three different surface modified chitosan films

When a burn injury occurs, the heat damage caused increases the microvascular permeability. This increased permeability leads to plasma leakage into the interstitial spaces of cells, which can lead to hypovolemic shock. One approach to reduce the likelihood of hypovolemic shock is to reduce microvascular permeability. Oxidants serve as agonists that increase post-burn microvascular permeability through increasing the concentration of reactive oxygen species, ultimately leading to oxidative stress. Microvascular permeability remains in an elevated state when the rate of reactive oxygen species generation is greater than the body's rate of detoxifying. One strategy to inhibit oxidative stress is to introduce antioxidants directly to the burn site. Current studies regarding burn wounds focus on healing after the initial injury. Methods to stabilize the patient before significant plasma leakage occurs remain relatively unexplored.

This work focused on developing a burn wound patch with antioxidant properties towards the goal of reducing microvascular permeability. Chitosan films were prepared using an established drop casting method, followed by oxygen plasma activation ($P=50$ W, $p\sim 227$ mTorr, time exposed=1 min 30 s). Films were then submerged in three different aromatic antioxidant solutions (aniline, carvacrol, cinnamaldehyde). Film wettability was analyzed using water contact angle goniometry. Untreated films exhibited water contact angles of $92.4 \pm 4.6^\circ$ whereas the activated films displayed water contact angles of $14.4 \pm 0.4^\circ$, demonstrating increased surface energy following activation. Fourier transform infrared spectroscopy was used to confirm the presence of antioxidants on the film surfaces. Additionally, an assay to quantify the radical scavenging activity of modified and unmodified films was performed. Initial results showed that films exhibited radical scavenging activity levels ranging from 26 to 57%, indicating that all surfaces studied have some degree of antioxidant activity. Overall, this work opens new directions for burn wound antioxidant therapy.

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Chemistry and Biochemistry

Using Quantum Chemistry to investigate the environmental impact of Pyrethroids and Pyrethrins

Pyrethroid insecticides are synthetically derived based on the structure of natural insecticidal pyrethrins, such as Jasmolin II and Cinerin II, found in chrysanthemum flowers. While pyrethrins tend to rapidly degrade, pyrethroids, such as Permethrin, Cypermethrin and λ -Cyhalothrin, remain pervasive in water and soil ecosystems after application. The origins of this difference in stability are not fully understood. Using computational models to compare the lower stability pyrethrins with synthetic pyrethroids will provide atomic-level insight into their structural differences and degradation products, enabling more targeted approaches in defining the environmental impact of these eco-toxins. The first iteration of the computational model employed Density Functional Theory to find low energy ground states, however both pyrethroids exhibited large degrees of freedom preventing an efficient determination of the most stable conformations. To address the large variations of the ground state structure, the molecules were treated using an ab initio molecular dynamics scheme and this was used successfully to determine a representative sampling of low energy conformations. Using these low energy conformations, excited state calculations were then performed on Permethrin, Cypermethrin, λ -Cyhalothrin, Jasmolin II and Cinerin II. Using these structures, the electron orbitals and absorption spectra were compared to determine the origin of the differences in reactivity. This study will increase knowledge on why pyrethroids are environmentally stable when similar structure pyrethrins are not. Future work will include potential energy scans and force calculations to determine detailed degradation pathways for pyrethroids and pyrethrins.

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Nursing

Does early-mobilization play a significant role in open heart patients' difference in length of stay?

This quasi-experimental study will evaluate whether or not early mobilization of post open-heart patients decreases the length of their hospital stay. The study will take place at Saint Agnes Hospital in Fresno, California, whose guidelines for open-heart patients is to ambulate on post-op day one and discharge on day five. This study will compare two groups; patients discharged on or before day five and those that are discharged on days six or seven. It is the assumption of the researcher that patients who are discharged after day seven would have had significant surgical complications. A retrospective chart audit of each group will determine if patients were ambulated at least three times daily, beginning on post-op day one. Results of the audit will be analyzed using an independent T test to determine if early mobilization made a significant difference in length of stay.

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Chemistry and Biochemistry

Effects of ambient and elevated temperature aging on plasma treated silk film hydrophobic recovery

Plasma - the fourth state of matter - is composed of radicals, ions, and electrons. Low temperature plasma is widely researched to modify surfaces. It can be used to change the surface chemistry of a material by activating the surface to make it more reactive. Silk fibroin (*Bombyx mori*) is an excellent candidate for plasma modification. Silk has potential for biomedical use as it is non-reactive, non-immunogenic, and biodegradable. However, silk films are relatively hydrophobic without modification, which can be problematic in vivo due to lack of interaction with biological species. Low-temperature nitrogen plasma is a potential strategy to make silk more hydrophilic. However, nitrogen plasma-modified polymers have been shown to exhibit hydrophobic recovery. In this process, modified polymer chains rearrange to a lower energy state and the surface reverts back to being hydrophobic. Temperature could potentially affect hydrophobic recovery as it is likely to impact polymer chain mobility.

In this study, the goal was to determine to what extent hydrophobic recovery occurred when silk films were subjected to high temperatures (60°C) after nitrogen plasma treatment. Two variables were explored: 1) the effect of plasma treatment on surface wettability and, 2) the effect of temperature on hydrophobic recovery. Nitrogen-treated and untreated control films were aged under both ambient and elevated temperatures. Samples were aged for up to six weeks, and sample wettability was analyzed at days 0, 7, 21, and 42. Wettability data (water contact angles, WCAs) were collected using a goniometer to determine how hydrophobic a surface is relative to another. WCAs of nitrogen-treated silk aged under ambient temperature remained constant, suggesting hydrophobic recovery did not occur. Similar results were observed with silk aged under elevated temperature. These results suggest that nitrogen plasma-treated silk samples can be stored at temperatures below 60°C for prolonged time periods without their surface properties changing.

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Barriers Associated with HPV Vaccination Among Parents or Guardians of Male Adolescent in Fresno County

Background: The human papillomavirus (HPV) is one of the most common sexually transmitted infections in the United States. The human papillomavirus is the leading cause of cervical cancer. In addition, over the years this virus has also been linked to anal, penile, vulvar, vaginal, and oropharyngeal cancer. The Centers for Disease Control and Prevention estimates that HPV vaccine has the potential to prevent more than 90% of HPV-related cancer cases. The HPV vaccine was first introduced in the United States in 2006 for female adolescents and young women. In October of 2009, the vaccine was approved for both males and females, ages nine to twenty-six years. Despite the safe and efficacious results of the vaccine, vaccination rates remain low in the United States.

Objective: The purpose of this project was to assess for barriers associated with the HPV vaccination among parents or guardians of age-appropriate male adolescence in Fresno County. This study will help determine whether additional research or program implementation is necessary to increase HPV vaccination rates.

Methods: This project used a vaccine hesitancy survey to help identify barriers to vaccination. The participants of this project are clients of Sang Pediatric. The investigator conducted the survey once a week from October 18, 2022 to January 31, 2023. Participants included parents or guardians of male adolescence, age 11-18, speak and read English. Those who do not read or speak English were excluded from the study; along with any participants who have already vaccinated their child with the HPV vaccine.

Results: A total of 16 participants completed the survey.

Conclusion: Data is being evaluated and the conclusion will be complete prior to the conference.

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Plant Science

Testing for Herbicide Resistance in Californian *Amaranthus tuberculatus*

Our project studies an agricultural weed, *Amaranthus tuberculatus*, commonly referred to as waterhemp, which has been introduced to California's Central Valley in the last decade. The purpose of this project is to identify potential herbicide resistance-causing mutations in the EPSPS and ALS genes of Merced County-based populations of *Amaranthus tuberculatus*. The EPSPS and ALS genes are respectively associated with resistance to glyphosate (RoundUp®) and acetolactate synthase (ALS)-inhibiting herbicides. While such mutations and herbicide resistance have been observed in Midwestern agricultural systems—where *A. tuberculatus* originates and predominates—waterhemp is a recent addition to California weed species and remains in concentrated populations within Merced County. As a result of its recent introduction, the Merced populations of waterhemp may not have yet developed resistance-causing mutations to glyphosate and ALS inhibitors due to a lack of prolonged generational exposure to either class of herbicide in California. Analysis of both genes has been conducted with DNA extracted from seven distinct populations of waterhemp within Merced County. Genetic work on the ALS gene has been carried out via polymerase chain reaction and gel electrophoresis, with PCR product then being sequenced and analyzed using the Geneious software platform. The presence of multiple copies of the EPSPS gene is being monitored with the use of real-time PCR (qPCR). Analysis of the ALS gene has yielded observations of potential polymorphisms which may suggest ALS-inhibitor resistance within select sample individuals of specific waterhemp populations in Merced County. However, qPCR results and data analysis of the EPSPS gene suggest so far that glyphosate resistance within the observed populations has likely not developed. Genetic analysis of localized Merced populations of waterhemp provides greater insight into the development of herbicide resistance within the species, with findings potentially applying to comprehending the broader impact of herbicide reliance in weed management systems.

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Role of Common Resident Gut Bacteria in Colorectal Cancer

Colorectal cancer (CRC) is a leading cause of cancer-related deaths globally. Incidence rates among individuals under 50 years are rising, which has led to the lowering of the recommended screening age from 50 to 45 years for those at an average risk. While numerous risk factors are associated with the development of CRC, the majority of cases contain microbial signatures representative of dysbiosis, indicating a role for the gut microbiome in disease pathogenesis. To date, most research has investigated microbiota independently of each other; however, it is widely accepted that microbiota interact with each other in the gut. More recently, two specific species of the microbiota have revealed a pro-carcinogenic synergism in vivo. Strains of both *Bacteroides fragilis* (*B. fragilis*) and *Escherichia coli* (*E. coli*) have been linked to CRC in clinical studies and been shown to induce carcinogenesis in mouse models through *B. fragilis* toxin (BFT) and colibactin, respectively. In this review, we discuss the roles of *B. fragilis* and *E. coli* in a healthy and diseased gut, current evidence associating each bacterium with CRC individually, and their synergistic contributions to the pathogenesis of CRC. Future investigation of CRC should focus on bacterial biofilms and additional potential pro-carcinogenic synergisms between other species of the gut microbiota to improve prevention and screening measures.

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Health Care Workers' Experiences of Burnout and Resilience During the Covid-19 Pandemic

The present qualitative study explored the experiences of healthcare workers during the Covid-19 pandemic outbreak. As healthcare workers continued to carry on with their duties despite fear of infection, insufficient personal protective equipment, increased exposure to death, and uncertainty of mandates, this study explored risk and protective factors such as burnout and resiliency. The study sample comprised nine healthcare workers (three females and six males) who worked during the Covid-19 pandemic in different positions in healthcare settings (social workers, doctor, ICU nurse, phlebotomist, medical assistants, pharmacist, and an infection prevention analyst) with 3 to 17 years of experience. Data collected from narrative interviews were transcribed, coded, and analyzed for significant themes and patterns that provide crucial information to optimize the resilience of healthcare workers in future pandemic situations. Participants reported burnout from changing workplace mandates related to Covid-19, increased job demands, changes in the sense of appreciation, ethical dilemmas, and fear of infecting family members heightened by increased exposure to death. Healthcare workers' resiliency through the pandemic was assisted by the support of their families, peer support, and a sense of duty. The results of this study contain significant implications for two of the most crucial professions, the healthcare professions and the social work field. It highlights the need to recognize the importance of the well-being of the professionals in healthcare settings who put their needs aside to care for the population.

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Criminology Department

Citizens' Perceptions of Police Officer Race, Gender, and Use of Coercion in Response to Domestic Dispute

How police officers respond to domestic calls has been a hot topic not only for the media, but empirical research as well. Most of the literature focuses on how citizens' race and gender impact interactions with officers; however, little to no research has examined how officers' race and gender may be perceived by citizens in different types of coercive scenarios (Chenane & Wright, 2018; Cochran & Warren, 2012). The goal of this study was to examine how the race, gender, and use of coercion by a law enforcement officer impacted the participants' perceptions of the officer and the police-citizen interaction.

Student participants read a brief scene where they were hypothetically involved in a domestic dispute with their father. They were also presented with a photo of a responding police officer, which was either the same or different gender and race compared to themselves. Next, they were asked which actions the officer should take in responding to the domestic dispute call. After that, participants were randomly presented with the officer resolving the situation with either coercive or non-coercive actions, followed by a questionnaire in which they provided their thoughts about the officer and their actions. Interestingly, preliminary results indicated that from the photos alone, same-gendered officers were perceived as more attractive, trustworthy, supportive, competent, and fair. Additionally, regardless of how coercive the officer was, officers that were the same gender as the participant were perceived as more trustworthy, and made more correct and satisfactory decisions. Participants that were the same race and same gender as the officer were also perceived as more trustworthy and supportive than those of same race and different gender.

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*Chemistry and Biochemistry***Conformational analysis of amide bonds: Exploration into Enthalpy-Entropy Compensation under mixed solvent conditions**

DEET (N, N-diethyl-m-toluamide) is widely used as a mosquito repellent and is also known to repel the Spotted Wing Drosophila (SWD), an invasive agricultural pest; however, its efficacy is limited. Our research aims at the development of DEET analogs as effective SWD repellent. Extensive and ongoing conformational analysis of the restricted amide bonds in our DEET libraries revealed validity of enthalpy-entropy compensation (EEC) phenomenon. Effect of electronic variations, steric hinderance, acyclic and cyclic amino moieties, and lastly solvents have been tested on EEC. In this body of work, we plan to further explore the EEC phenomenon by conducting experiments with mixed solvents of varying molar ratios to determine the validity of this concept. Dynamic nuclear magnetic resonance (DNMR) experiments were conducted on 1-benzoyl pyrrolidine, a control from our library of derivatives of DEET, in CDCl₃ (Dielectric constant $\epsilon=4.81$), DMSO-d ($\epsilon =46.7$), and various molar ratios of the two. The experimental design allowed for variation in the dielectric constants present in the sample while preserving the role of the solvents on the analyte. Line shape analysis was used to estimate the chemical exchange between the two methylene protons adjacent to the amide bond on the DEET analog, enabling the study of conformational changes of the restricted amide bond. The enthalpy of activation (ΔH^\ddagger), the entropy of activation (ΔS^\ddagger), and Gibbs free energy of activation (ΔG^\ddagger) were determined through Eyring analysis of the chemical exchange rates. These experiments will contribute to a growing body of data into our chemical library's potential for interactions within SWD's odorant and gustatory binding sites.

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Chemistry and Biochemistry

Synthesis of Benzofurans via Au(I)-Catalyzed Cyclization of 2-Alkynyl Phenol Derivatives

Benzofurans are molecular motifs found in a wide variety of natural products and pharmaceutical compounds, such as dronedarone and amiodarone (antiarrhythmic), or naloxone (opioid antagonist). Due to the importance of benzofurans, multiple synthetic methods have been developed that focus on constructing the heterocyclic core. Among those, gold(I)-catalyzed cyclization of phenols onto alkynes has emerged as one of the leading methods of forming the fused bicyclic structure. Although robust, the general method is limited to free phenols (R-OH) and does not work well for alkylated derivatives (R-OR'). We discovered that phenols with O-tetrahydropyran (OTHP) group can undergo efficient cyclization catalyzed by gold(I)-NHC complexes and produce the benzofuran heterocycle in high yields (80-95%). In contrast to our previous work, the OTHP derivatives don't undergo rearrangement, rather the THP substituent is removed during the cyclization event. We also developed an assay to measure reaction yield using quantitative HNMR spectroscopy (qHNMR). Our study shows that a two-reaction sequence, a Sonogashira cross-coupling to synthesize the alkynes, followed by gold(I) catalyzed cyclization, is an efficient way to synthesize a variety of substituted benzofurans. The details of reaction optimization and substrate scope survey will be presented.

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Chemistry and Biochemistry

Epitope Characterization of MUC16 Antibodies

MUC16 (CA125) is a mucin protein known to be overexpressed in many types of cancers including ovarian, breast and pancreatic. The serum form of the protein is currently used as a biomarker for cancer diagnosis and monitoring the progression of treatment efficacy. MUC16 plays an active role in promoting cancer by inducing cell growth and suppressing apoptosis. Because of MUC16's prominent role in cancer, researchers have developed antibodies that target MUC16. However, the exact epitope and binding characteristics of MUC16 antibodies remains unknown. In this study, we aim to determine the affinities of MUC16 antibodies (AR9.6, B43.13, and Sofitzumab) to recombinant MUC16 tandem repeat domains, to determine if there is an immunodominant epitope. We also seek to understand the role MUC16 glycosylation plays in the binding of its antibodies. Using ELISA assays to determine the affinity of the antibodies, we have found that AR9.6 and B43.13 strongly bind the SEA5 domain, while all three antibodies bound poorly to SEA domains 7, 9, and 10. Additionally, we have found that the antibodies do not compete with each other for their epitopes and that glycosylation impacts antibody affinity. These results suggest that MUC16 does not possess an immunodominant epitope, but rather each of the antibodies bind a unique epitope on MUC16. Further testing of the antibodies' affinity to other SEA domains will be performed to fully characterize their binding of MUC16.

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Criminology

Female College Students' Perspectives on Sex Education, Campus Climate, and the Role of Greek Life in Preventing Campus Sexual Assault

College-aged women (and men) are at a higher risk for sexual assault than other age groups (RAINN, 2022). Moreover, research finds that half of sexual assaults on college campuses occur in the first four months of the fall semester and students are at heightened risk for sexual victimization in their first and second semester of college (RAINN, 2022). However, research linking sexual education in high school to education, prevention, and victimization in college is limited, and college sexual assault research focuses on white middle class experiences. The current study aims to address this by exploring female college students' experiences and perspectives around learning about healthy sex and relationships prior to and during college. Semi-structured in-depth interviews (n=14) were conducted with female undergraduate students who belong to sororities (Panhellenic and multicultural) on campus. Guided by a gendered organization framework, findings illustrate the ways that female undergraduate students navigate social contexts unique to Greek life and recommendations for improving campus climate. Specifically, findings underscore the heteronormative nature of sororities and fraternities and the prevalence of rape culture on college campuses. Findings extend our understanding of gender-based violence in higher education. Recommendations for policy and prevention education are also presented.

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ELECTRONIC HAND HYGIENE MONITORING SYSTEM TO PREVENT HOSPITAL ACQUIRED INFECTIONS

A hospital acquired infection is one that cannot only be detrimental to one's health, but it can cause death to those who are already immunocompromised, which is basically every patient in the hospital. Due to this, emphasis has always been placed on promoting proper hand hygiene throughout healthcare facilities, especially hospitals. Many healthcare facilities began campaigns, created acronyms, and hired employees to directly observe healthcare workers in their workplace to monitor trends of hand hygiene. With these efforts, hand hygiene compliance increased because healthcare workers were educated about the importance. However, compliance soon reached a plateau. Therefore, healthcare facilities are trying new innovative ways to increase compliance by utilizing an electronic hand hygiene monitoring system that works by tracking each employees individual hand hygiene performance. The goal is to determine whether this electronic method increases hand hygiene compliance and contributes to the decrease of hospital acquired infections. The infection prevention department will be contacted to obtain hand hygiene compliance data of all hospital healthcare workers and look at the rate of hand hygiene compliance. Hospital acquired infection data 6 months prior and 6 months post implementation of the electronic hand hygiene monitoring system will be reviewed. There will be a comparison of hand hygiene rates and hospital acquired infection rates. This will show how the new system affected the hospital acquired infection rates. Results pending completion of the project.

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Management

Consumer Purchase Intentions in Ethnic Cuisines: What Matters More: Authenticity or Pricing?

This paper seeks to understand the role of authenticity in ethnic cuisines classified as top dogs and underdogs. Top dog cuisines are market leaders because they are the ones most represented in a market, or because they have the prestige to influence the techniques and menus of dining establishments. Underdog cuisines are, in contrast, those who are struggling against all odds to succeed in order to gain interest or awareness from customers and the media. Drawing on the theoretical framework suggested by Carroll and his colleagues (e.g., Carroll & Wheaton, 2009; O'Connor et al., 2017), this research distinguishes between four types of authenticity: type authenticity, craft authenticity, moral authenticity, and idiosyncratic authenticity. We hypothesize that in order for consumers to pay more for the underdog cuisine (Ethiopian), the following criteria are needed: appeals to type authenticity and low prices. Conversely, we expect that for consumers to pay more for the top dog cuisine (French), the following conditions need to be met: appeals to moral authenticity and high prices. Our preliminary data support our hypotheses, indicating that type authenticity and lower prices significantly influence consumer purchase intentions for Ethiopian food compared to French food. This suggests that underdog cuisines can benefit from utilizing appeals to type authenticity. Our findings have implications for chef owners and restaurateurs of ethnic restaurants that would like to optimize their business strategy in order to maximize profits.

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Elucidating the mechanisms controlling toxicity of pathological tau in neurons

Neurodegenerative diseases, including Alzheimer's disease and frontotemporal dementia (FTD), impact millions of people worldwide, yet the mechanisms underlying disease progression are not fully understood. A hallmark of several neurodegenerative diseases is toxic buildup of the protein tau, which is linked to neuronal death. Harmful tau mutations are known to cause FTD, but how mutant tau causes disease is unknown. We culture neurons with the mutant tau variant V337M from stem cells derived from FTD patients to study this pathway leading from abnormal tau to neuronal death. We have shown that V337M neurons exhibit decreased survival and mitochondrial accumulation due to decreased breakdown of mitochondria. Through genetic screening methods, we identified that knockdown of the neuron glutamate receptor protein GRIN2A rescues these survival and mitochondrial phenotypes. Interestingly, we found that this rescue is not due to changes in neuronal activity but instead through signaling that changes transcription of neuron outgrowth factors. Our model is that mutant tau drives abnormal signaling pathways via GRIN2A that encourages neuron processes, such as axons and dendrites, to explore their environment less and grow further outwards. Our results suggest that GRIN2A plays a key role in the biological mechanisms downstream of mutant tau and may become a potential target for future study of neurodegenerative diseases.

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Biology

The Effects of Ionizing Radiation on Neuronal Stem Cells

Radiation therapy and chemotherapy are commonly used together in treatment of brain tumors; however, previous studies have identified them as factors that cause chronic conditions of neurocognitive impairments which physicians have observed in over 90% of patients who were treated for CNS tumors. The objective of this project is to evaluate the metabolite and health profiles of mouse neuronal stem cells (NSCs) in vitro pre- and post-irradiation to gain insight into the phenomenon of radiation-induced bystander effect (RIBE). Using ¹H-nuclear magnetic resonance (NMR), we can analyze the differences in the metabolic profiles and flow cytometry to analyze NSC health over time. The intent of this study is to develop a better understanding of the mechanisms from a metabolic perspective that are responsible for the observed NSC death model. To carry out this experiment, the conditioned media from irradiated cells was transferred into dishes of healthy cells to mimic the RIBE parameters. NMR will be used to study the cell's metabolomic changes as morphological changes are clearly observed several hours post-radiation indicating characteristics of cell damage. In addition, flow cytometry and imaging will be used to verify the state of these cells. The results of this study will not only provide us with a better understanding as to how ionizing radiation affects cellular mechanisms through RIBE, but will also have a clinical application in creating specialized radiation treatments for patients suffering from CNS tumors.

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Determination of Clove Oil Composition by Quantitative NMR Spectroscopy

Plant extracts, or more commonly known as essential oils, are steamed or pressed to capture its pleasant fragrances that captivated the ancient world and continue to be used in present times. Examples of their applications can be found far beyond culinary arts in areas, such as cosmetics and medicine. Previous research has identified the composition of clove oil and thus given an approximate fraction of cloves as a 9:1 ratio between eugenol and acetyl eugenol. This composition is most often determined by gas or liquid chromatography, but those are dependent on instrument-specific parameters (stationary phase, mobile phase, detector, flow rate, etc.). This project examined the use of quantitative NMR (Nuclear Magnetic Resonance) methods to investigate the composition of clove oil obtained by steam distillation of clove buds. Here we present the results of an investigation into the clove oil composition depending on a number of variables, such as the use of different parts of the clove bud, the source of plant material, its size and method of extraction.

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Animal Science

Malaria prevalence in overwintering ground sparrows of the Central Valley of California

Avian malaria is a bloodborne illness caused by Haemosporidians that is threatening many bird species by impacting their survival and lowering their reproductive success. Climate change models predict that dryer weather and warmer temperatures will increase the presence of stagnant water, providing vectors of avian malaria (e.g., mosquitoes) a chance to increase in population size and expand their range. Migratory songbirds can increase the spread of novel avian malaria lineages between their breeding and overwintering territories. Research on avian malaria lineages in breeding birds is well established, however, this research is limited in overwintering birds. The Central Valley of California provides a unique opportunity to study migratory birds that may contract or carry novel malaria lineages, as many birds overwinter here. In this study, I used a nested polymerase chain reaction (PCR) to verify the presence or absence of avian malaria in three species of migratory overwintering ground sparrows (Passerellidae; white-crowned sparrows [n=26], golden-crowned sparrows [n=8], and spotted towhees [n=17]) sampled from November 2021 to March 2022. More than 50% of the sparrows had either a chronic or acute avian malaria infection from the genera Plasmodium and/or Haemoproteus. Sanger sequencing is underway to identify the malaria lineages, which will contribute to the avian malaria initiative MalAvi database. Future research will involve measuring parasitemia through microscopy or quantitative PCR. Overall my data will shine light on how widespread avian malaria is in ground sparrows during the understudied overwintering period and add to the growing database of novel parasite lineages.

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Psychology

Perception of Gender Roles, Self-Esteem, and Well-Being Among Latinx College Students: Does Bicultural Self-Efficacy Buffer this Relationship?

Some conceptual models of gender contend that gender roles can lead to power imbalances and inequities, negatively impacting mental health and self-esteem (Cano et al., 2020). In addition, self-esteem is a salient indicator of mental health and well-being during emerging adulthood, particularly among Latinxs (Chung et al., 2014). A common feature of Latinx culture is adopting cultural values, such as gender roles. The basis of traditional gender roles is set expectations based on biological sex (Blackstone, 2003). While among Latinxs, there is an association between cultural values and indices of well-being (Cano et al., 2020), less is known about factors that can impact this relationship. The influence of bicultural self-efficacy is of interest, defined as one's confidence level to work within their heritage and host culture (Cano et al., 2021). Related research has noted the protective influence of bicultural self-efficacy among Latinx emerging adults (Cano et al., 2020). Thus, this study focuses on perceived gender roles and well-being among Latinx college students, which utilizes bicultural self-efficacy as a moderating variable. Participants ($n = 264$, 72.7% female, mean age = 19.50) were enrolled in an introductory psychology course at a 4-year university in central California. Participants completed items that examined traditional gender roles (Knight et al., 2010), bicultural self-efficacy (David et al., 2009), self-esteem (Rosenberg, 1979), and depression, anxiety, and stress (Lovibond & Lovibond, 1995). Preliminary analyses did not support the first hypothesis of an association between gender roles and well-being. Similarly, moderation analyses did not support the second hypothesis of bicultural self-efficacy functioning protectively. However, regression analyses demonstrated that bicultural self-efficacy was positively associated with self-esteem ($b = .38$, $se = .07$, $p < .001$). While the results did not support the study hypotheses, findings may be more salient among females and different facets of bicultural self-efficacy.

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Grey Matter Depletion in Conduct Disorder Adolescents through Structural Magnetic Resonance Imaging Studies

Conduct disorder (CD) refers to a collection of adolescent behavioral and emotional disorders of socially unacceptable mannerisms such as hostility, aggression, and violation of established rules. Total grey matter volume (GMV) is low in patients with CD, and abnormal changes in specific areas for socioemotional stimuli processing were found. Psychiatric diagnoses of various behavioral disorders have been increasingly supplemented with structural magnetic resonance imaging (sMRI) to analyze and measure architectural changes within the brain; therefore, sMRI has the potential to serve as a radiomarker for CD diagnosis. This systematic review demonstrates how CD has been linked to radiographic imaging of grey matter regions involved in socioemotional stimuli processing found in female and male adolescents. A literature search was conducted in electronic databases, including PubMed, ScienceDirect, and Google Scholar. Studies published between June 2011 and February 2023 that used sMRI to investigate socioemotional-related grey matter depletion in CD were included. The search terms included "Conduct Disorder," "MRI," and "grey matter." A total of 20 studies met the inclusion criteria and were included in this review. A suggestive association between conduct disorder and consistent radiographic findings of reduced grey matter involved in emotion and behavioral processing through sMRI scans was observed in these studies, and we evaluated their findings. We found that the total GMV was reduced in the anterior cingulate gyrus, insula, parahippocampal gyrus, right ventral striatum, and orbitofrontal cortex. Depletion of GMV in the temporal lobe, frontal lobe, parietal lobe, and cerebellum posterior lobe was also identified. The effects on the amygdala, however, presented conflicting discoveries in size changes due to CD, and thus require additional investigation. These radiographic discoveries may present a more tangible method to identify CD while offering the potential for medical imaging to be used as a diagnostic criterion in psychiatric illnesses in the future.

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Agribusiness & Food Industry Management/Agricultural Science Department

Current Impacts of Strategic Disruptors on Agri-Food Subsectors

This research addresses post-pandemic strategic disruptors and their impact on agri-food subsectors. Cal Poly Pomona Agribusiness & Food Industry Management faculty implemented strategic planning in fall 2022. The objective was to investigate changes in selected agri-food subsectors to provide input for our future direction. The investigators identified three agri-food subsectors to examine: agricultural lending, landscaping, and the grocery industry. We interviewed three industry representatives representing these subsectors. Each interview employed the same list of questions, and at least two investigators were present at the interviews.

Summary of results**A. Agricultural lending**

There is a move toward a scorecard model, instead of a case-by-case analysis of loan applications, and a shortage of candidates with agricultural knowledge. Remote work continues to evolve. The volume of agricultural lending has grown. Agricultural producers in the western U.S. have consolidated so loans have been getting larger.

B. Landscaping Industry

Labor issues are very important. SoCal companies have difficulty attracting unskilled workers. The nursery industry has experienced significant consolidation and the breadth of product lines has decreased. Water availability, emerging anti-herbicide activism, and new technology for landscaping managers are also issues.

C. Grocery Industry

Suppliers increased prices frequently in 2022. Employee churning is very high due to changes in culture and job-hopping. Younger, health-conscious shoppers engage online with the stories behind the brands and products. Due to transportation and other issues, grocery stores are having difficulty getting fresh products like lettuce.

Conclusion

The global pandemic had a major impact. Throughout the economy, people learned how to do things remotely. Remote work is an unresolved issue. Diversity, equity, inclusion, environmental sustainability, and climate change are emphasized throughout American business and society. These megatrends are affecting the U.S. and the rest of the world. They will impact businesses and academic programs.

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Chemistry and Biochemistry

Synthesis of Dehydroabietylamine Derivatives as Potential Androgen Receptor N-Terminal Domain Antagonists

Prostate cancer is one of the deadliest cancers among men in the United States, responsible for roughly 34,700 deaths in 2022. Even with currently available treatments, the disease can develop into castration-resistant prostate cancer (CRPC), which can continue to progress when the transcriptional activity of the androgen receptor (AR) reactivates. AR, therefore, remains to be the viable therapeutic target for CRPC. Deadly CRPC can likely be treated by targeting another functional domain on the AR. Tricyclic aromatic diterpenoid QW07 was reported to block the transcriptional activity of AR NTD (N-terminal domain). However, QW07 does not show selective suppression of AR-positive cell proliferation over the AR-negative one. This study aims to develop tricyclic aromatic diterpenoids as potential NTD AR antagonists. We envision the target tricyclic diterpenoids that can be synthesized through chemical manipulation of commercially available dehydroabietylamine can selectively suppress AR-positive prostate cancer cell proliferation by interacting with AR NTD. Twelve derivatives have been designed by adding different chemical moieties to the C-18 position. These compounds have been synthesized and characterized by interpreting their ¹H NMR, ¹³C NMR, high-resolution mass spectroscopy, and infrared spectroscopy data. These derivatives have been evaluated for their anti-cancer potency on AR-positive prostate cancer cell lines (LNCaP, 22Rv1, and VCaP) using AR-negative cell models (PC-3 and DU145) as a comparison. The antiproliferative data from WST-1 bioassay indicated that dehydroabietylamine derivatives can suppress AR-positive prostate cancer cell proliferation.

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Chemistry and Biochemistry

Observing the photoexcited states of phenylurea herbicides

Photodegradation is one of the primary abiotic mechanisms by which organic molecules can break apart. In the Central Valley, a large quantity of these herbicides negatively affect the environment through the water supply, presenting potential health risks to humans and the environment. Developing a detailed understanding of herbicide photodegradation is not possible based purely on experiment due to the complexity of the systems. The structural simplicity of phenylurea herbicides makes them ideal molecules to study computationally. In particular, diuron is one phenylurea molecule that is very well-studied, and its extensive work serves as a starting point against which the results for other molecules of similar structure can be compared. The objective of this project was to conduct a comparative study to observe how phenylurea herbicides undergo photodegradation, and what can be expected from each molecule based on structural properties. This question was answered by performing geometry optimization, frequency analysis, excited state, and force calculations for twelve different phenylurea molecules, including diuron. The calculations for each of the twelve molecules were performed on QChem, a commercially available software package that uses density functional theory-based methods with Gaussian basis sets (6-311G** and 6-311++G**). Various classes of density functional methods (B3LYP, CAM-B3LYP, B88-LYP, and w-B96) were used to compare the structure and properties of the twelve phenylurea molecules. As a result of comparing molecules' excited states, it was decided that CAM-B3LYP out of the four functional methods was the best to move forward with the state derivative forces calculations and future work. These empirically supported predictions for these methods serve an important role in that safer, more effective alternatives can be developed in place of pesticide applications if the photodegradation products for a given class of molecules can be accurately predicted.

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Public Health

Spatio-Temporal Analysis of Traffic-Related Air Pollutant Concentration and ED Visits/Hospitalizations in ZIP Codes throughout the Fresno/Clovis Metropolitan Area

The City of Fresno ranks highest nationally for worst air quality. Notably, Fresno's particulate matter levels surpass local and state standards established by the Environmental Protection Agency (EPA), resulting in cardiopulmonary health impacts. The primary aim of this study is to observe a potential association between annual average traffic-related air pollutant (TRAP) concentrations for specific pollutants in ZIP Codes throughout the Fresno-Clovis metropolitan area from 2013-2018, and the annual number of patients seen at a hospital for acute cardiovascular or respiratory conditions from select ZIP Codes during the same timeframe.

The annual pollutant concentrations for particulate matter 2.5 (PM2.5) between 2013-2018 for three ZIP Codes in the Fresno-Clovis metropolitan area were collected from the California Air Resources Board (CARB). Annual emergency department (ED) visits for asthma were obtained from the California Health and Human Services (CHHS) Open Data Portal. An exploratory analysis was conducted to assess data trends. Our results show that there is a linear relationship between PM2.5 concentrations and annual asthma ED visits. The ZIP Code 93702 showed a positive association, while 93612 and 93726 showed negative associations. The average PM2.5 concentration was highest in 93702. The ZIP Code 93702 also had the highest percentage of average Asthma ED visits per total population, while 93612 had the lowest. The areas of high pollutant concentration are known to also have low socioeconomic status (SES). As such, the results may reflect the greater means through which individuals living in low pollutant regions of the city can access emergency services.

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Mechanical Engineering

Novel Design of the EpiPen Facilitating for Reloadable Dosage

This project aimed to research different injection syringes, like reloadable ones used for cattle and different diabetes injectors, in order to design a more efficient and environmentally friendly epinephrine auto-injector. By decreasing the cost of materials and introducing a new product into the monopolistic field, we plan to drive prices down and make the EpiPen more accessible. We also plan to design an EpiPen to allow users to reload the medicine into the same canister after they clean it, ceasing the use of disposable injectors. First, research was done to understand the different components of an EpiPen, how the monopoly on epinephrine was created, and how other devices with a needle allow users to reload medicine. Then, different devices with spring loading mechanisms were analyzed to understand how to implement them in our design. Using the knowledge from the research phase, the new design of the EpiPen was created and 3D printed. The resulting product was tested using water and a silicone mold to imitate an EpiPen injecting epinephrine into the skin. Based on how it performed, small changes were made to perfect the design and functionality. In conclusion, by understanding the components of an EpiPen through research and dissecting expired EpiPens, the study resulted in an EpiPen design that shows strong promise to accomplishing the stated objectives.

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Chemistry and Biochemistry

Alzheimer's Disease Drug Discovery: Development of Apolipoprotein E Inhibitors

Alzheimer's Disease (AD) is a neurodegenerative disease associated with deterioration of memory and cognitive function. Individuals diagnosed with AD experience progressive decline in expressive speech, memory, and visuospatial processing. Prevalent characteristics of AD are the amyloid-beta ($A\beta$) plaques that can form extracellularly throughout the cerebral cortex and the tau neurofibrillary tangles that are found intracellularly in the medial temporal lobe of the brain.

Specific isoform(s) of apolipoprotein E (ApoE), a carrier of cholesterol and phospholipids, is a genetic risk factor for AD. ApoE is associated with cholesterol regulatory transporters such as ATP-binding cassette A1 (AbcA1) and low-density lipoprotein receptor (LDLR). Researchers have also demonstrated that reduction of AbcA1 proteins led to the accumulation of $A\beta$ plaques, whereas the overexpression of AbcA1 reduced the accumulation.

Based on existing studies, this Alzheimer's drug discovery project focuses on the extracellular $A\beta$ plaques and aims to synthesize and screen an array of small organic arylmethyl amine compounds that decrease ApoE production and increase AbcA1/LDLR. The target scaffolds are synthesized primarily through a Grignard reaction and reacted with amines to create focused libraries of target compounds. This library of compounds will then be screened using a biological astrocyte cell assay and analyzed for their ability to lower the ApoE protein production and increase the AbcA1 protein or LDLR. It is hypothesized that lowering the ApoE and increasing either AbcA1 or LDLR, has potential to diminish or halt the progression of amyloid- β plaques and therefore improve the intracellular communication related to memory loss and deteriorating cognitive function.

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Civil and Geomatics Engineering

Is eShopping Taking Over In-Store Shopping? A Trend Analysis of Shopping Activity using the American Time Use Survey (ATUS) Data

Technological advancements in information, telecommunication, and supply chains have been bringing great changes to the fields of human travel behavior and transportation systems. This, in turn, affects transportation-related issues such as traffic congestion, energy use, and emissions. Shopping and Errands trips represent a large percent of human travel activity. Accordingly, changes in these trips could have significant impacts on our transportation systems. Various studies have investigated trip rates of online and in-store shopping. However, there appears to be a gap in the literature on studies that explore trends of activity times of online and in-store shopping. This paper presents the results of estimating trends of the amount of time a person spends each day engaging in online and in-store shopping activities. The developed trends are based on annual data from the American Time Use Survey (ATUS), from 2003 and until 2019. Activity of online and in-store shopping activity was defined using three measures: 1) average online and in-store shopping time per person per day, 2) percent of online and in-store shopping activities, and 3) average length of online and in-store shopping activities. Results of this work indicate clear and consistent evidence (across all three measures) of a slow but continuous increase in online-shopping and decline in in-store shopping activity.

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Do Telecommuters Make Fewer Trips? An Analysis of Telecommuting Travel Behavior in Urban and Rural Communities in the USA

Many believe that telecommuting could be a solution for some of the significant adverse impacts of our transportation systems, e.g., traffic congestion, greenhouse gas and air pollution emissions, and energy consumption. Observations may have further strengthened this belief during the first year of the COVID-19 Pandemic, where streets were deserted, and clean air and wildlife returned to urban areas. Accordingly, this study investigates the legitimacy of this belief.

The NHTS 2017 dataset was used to examine the travel activity of commuting workers against telecommuters. Workers were classified into one of five telecommute classes based on primary work location, telecommute engagement, logged trips, and option to telecommute: home-based workers (those who work predominantly from home), primary and ancillary telecommuters (those who telecommute), passive telecommuters (those who have the option to telecommute) and non-telecommuters. The various forms of telecommuting were found to significantly impact average daily trip counts and average daily trip miles produced in both urban and rural contexts.

Contrary to the possibly traditional belief, telecommuters made more trips per day and traveled longer distances per day compared to non-telecommuters. Additionally, the study investigated the differences in trip rates by trip purpose for each of the five telecommuting classes. The analysis revealed that while home-based work trips (HBW) trips for primary telecommuters decreased significantly, all other trip purposes increased (in number and distance) and in a higher manner than the decrease of the HBW trips. These findings indicate that telecommuting is likely to increase total VMT and associated negative impacts and should inform relevant transportation policies.

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Chemistry and Biochemistry

Targeted quantification of amino acids in metabolomics using ^{19}F NMR: A proof-of-concept application to citrus

In the rapidly growing area of metabolomics, nuclear magnetic resonance (NMR) based approaches play a notable role in studying chemical and biological processes. Most current NMR metabolomics study rely on spectral data from one-dimensional ^1H nuclei. Even at reasonably high magnetic fields (600 MHz), the extensive spectral overlap among the various molecules makes it challenging to distinguish and quantify the metabolites reliably. NMR studies involving ^{13}C nuclei, and two-dimensional experiments can increase the spectral resolution, but the approach has low sensitivity due to the low natural abundance of the isotope.

Since amino acids (AA) form a significant subset of metabolites in any metabolomics study, a proof-of-concept study on developing a method for amino acid identification and quantification using one-dimensional ^{19}F NMR spectroscopy is explored here. Based on the previously established synthetic procedure, a fluorine tag, 2,5-dioxopyrrolidin-1-yl-2-(trifluoromethyl)benzoate was synthesized and used to label the N-terminus of the AAs present in a study sample. Meanwhile, calibration experiments performed with individual AAs under the same sample conditions are used to identify and quantify the AA.

The ^{19}F -targeted detection was then applied to measure the level of AAs in the juice of store-bought navel oranges. Specifically, the AAs were first quantified using ^1H NMR spectroscopy to determine the efficiency of fluorine tag labeling. The ^{19}F tags were then incubated with the juice samples (three replicates). Our findings suggest that individual AAs can be detected and quantified using ^{19}F NMR spectroscopy. The study provides an avenue for further AA analysis without physical separation and isotope enrichment based on an amino acid ^{19}F labeling and NMR measurements.

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Comparison of antimicrobial and antibiotic topical use in central line maintenance in hemodialysis patients

With high morbidity and mortality rates, hemodialysis patients are considered a high-risk population. Prevention of infections and maintenance of central lines could help decrease this population's increased risk for complications. Infection rates for non-tunneled hemodialysis catheters with chlorhexidine-impregnated discs versus tunneled hemodialysis catheters with triple antibiotic ointment placed at the insertion sites were compared. This retrospective study was completed through electronic chart reviews at a Central Valley hospital from January 2019 through December 2021. The goal of conducting this study was to decide whether a change in central line maintenance policy could potentially lead to decreased catheter infection rates. Results pending final completion of project.

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Biology

The Role of Protein-X in Tunneling Nanotube (TNT) Formation

Tunneling nanotubes (TNTs) are cellular protrusions used for direct communication and transfer of material between cells. However, numerous infectious agents like HIV, COVID-19, and prions are known to spread using TNTs, so inhibiting TNT formation could be a way to block the spreading of infection and disease. Similarly, inhibiting the formation of TNTs in and around tumors could prevent cancer cells from maintaining an environment that fosters resistance to cancer treatment. Previous work in the Gousset lab has identified Protein-X as being enriched within TNTs using laser capture microdissection coupled with mass spectrometry (LCM/MS). The goal of this research is to follow up on the LCM/MS screen and evaluate whether Protein-X has a role in TNT formation. Methods of assessing TNT formation include quantifying the number of cells forming TNTs and evaluating Myosin-X (Myo10) expression levels since Myo10 is a known inducer of TNT formation. Immunofluorescence microscopy imaging qualitatively confirmed that Protein-X localizes within TNTs and complements the LCM/MS screen findings. Increasing Protein-X levels via plasmid overexpression led to a 2-fold increase in TNTs, while decreasing Protein-X levels via shRNA knockdown resulted in a 3-fold decrease in TNTs compared to controls. Increasing or decreasing Protein-X expression had no effect on Myo10 levels. However, increasing Myo10 levels via plasmid overexpression led to a 60% increase in Protein-X levels. This suggests that Protein-X and Myo10 act in the same pathway to regulate the formation of TNTs. This finding that Protein-X is involved in TNT formation addresses an important gap in this field, since there are few known regulators of TNT formation. Additionally, therapeutics can be developed to inhibit TNT formation using molecular targets from the Protein-X pathway.

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Chemistry and Biochemistry

Synthesis of Structural Analogs of Abietic Acid as Potential Androgen Receptor Antagonists

Androgen receptors are vital to the development and survival of prostate cancer. Treatments such as androgen deprivation therapy are used to control the spread of prostate cancer but become ineffective if the cancer develops into castration resistant prostate cancer (CRPC). Androgen receptor gene amplification and mutations to or the complete removal of the ligand binding domain in CRPC androgen receptors require new compounds that target a different region on the androgen receptor, such as the N-terminal domain. Compound QW07 is a tricyclic aromatic diterpenoid that was found to target the N-terminal domain but did not have specificity to AR-positive strains. Abietic acid, a natural tricyclic diterpenoid extracted from the resin of conifers, has been shown to have cytotoxic activity in human cancer cell cultures, with analogs showing greater specificity to certain cell lines. Seven schemes were created to produce structural analogs of abietic acid through the addition of electron-withdrawing groups and amines to C-18 of the carbon skeleton. The compounds synthesized were characterized by ¹H and ¹³C NMR, and IR. The cytotoxicity of three compounds were tested on two AR-positive prostate cancer cell lines (LNCaP and 22Rv1), with two other AR-negative cell cultures (PC-3 and DU145) used as a control. Our preliminary data indicates that abietic acid and its derivatives can suppress AR-positive prostate cancer cell proliferation. Further evaluation of the remaining derivatives is in progress to investigate any increase in potency.

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A Systematic Review of Functional Magnetic Resonance Imaging Studies Investigating Prefrontal Cortex Function in Attention-Deficit/Hyperactivity Disorder (ADHD)

Attention-deficit/hyperactivity disorder (ADHD) is a common childhood neurodevelopmental disorder characterized by symptoms of inattention, hyperactivity, and/or impulsivity. The prefrontal cortex (PFC), which plays a critical role in regulating attention, behavior, and emotion, is frequently dysfunctional in individuals with ADHD. To assess differences in the brain systems that underlie ADHD, modern psychiatric research has increased the utilization of functional magnetic resonance imaging (fMRI). The purpose of this systematic review is to provide an overview of recent studies that utilized fMRI for examining alterations of PFC function in ADHD. A systematic literature search was conducted in electronic databases, including PubMed, ScienceDirect, and Google Scholar. Studies published between 2013 and 2023 with the search terms "attention-deficit/hyperactivity disorder," "fMRI," and "prefrontal cortex" were included. A total of 20 studies were analyzed in this review. The results of this systematic review suggest that recent studies that used various fMRI techniques, including resting-state, task-based, and connectivity-based fMRI, have shown consistent alterations in PFC function in ADHD. Specifically, studies found reduced activation in the right dorsolateral PFC during working memory tasks in individuals with ADHD compared to controls. Additionally, increased connectivity between the PFC and the default mode network and decreased connectivity between the PFC and the striatum were identified in ADHD. These findings may have important implications for the development of targeted interventions and treatments for individuals with ADHD. However, more research is needed to fully elucidate the role of PFC dysfunction in ADHD and to explore the potential of emerging fMRI techniques for investigating this disorder. Overall, this systematic review underscores the value of fMRI as a tool for advancing our understanding of the neural basis of ADHD and for developing interventions to improve executive function in individuals with this disorder.

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Communicative Sciences and Deaf Studies

Latinx Deaf experiences navigating acculturation and resilience in childhood

Introduction: Latinx Deaf individuals are members of the Latinx and Deaf communities, which both experience discrimination from outside groups. However, little is known about the product of multiple forms of discrimination that may affect individuals, such as those who are Latinx Deaf. This study examines what factors may have affected Latinx Deaf individuals at home and school that influenced their resiliency and acculturation in their primary communities and other community groups of importance to them (e.g., LGBTQI+)

The study examined three research questions:

- 1) Identify acculturation challenges faced by Latinx-Deaf individuals in their childhood experiences
- 2) Describe factors that impact the resilience of Latinx-Deaf individuals
- 3) List approaches that may promote more holistic acculturation experiences for Latinx-Deaf children

Methods. The study utilized semi-formal interviews to collect data from 10 Latinx Deaf adult participants. Participants also completed the Connor-Davidson Resilience scale.

Results. The results suggested that the deaf Latinx individuals who had audible speech could sign, and family members who could sign had the highest level of resilience and connectedness. Moreover, findings suggest that participants with low resilience scores struggled to communicate with family members because families were unwilling to sign or felt they couldn't learn ASL because all the training materials were in English. Participants also indicated few opportunities to feel connected to their Latinx culture at school.

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Agricultural Business

Land Allocation in the San Joaquin Valley

This study focuses on the latest trends of agricultural land choices in the San Joaquin Valley and seeks to identify correlations between acreage, production, and total value of the selected specialty crops: nut crops, stone fruit, citrus, and grapes. The objective of this study was to determine the land allocation trends of the selected specialty crops within the San Joaquin Valley from 2000-2020. It was hypothesized that land allocation of specialty crops resulted in a tradeoff. As acreage of a certain specialty crop increased due to crop price, a decrease of land allocated to a different specialty crop was expected.

Land allocation models were compiled using annual county crop reports. County level data was aggregated to focus on selected specialty crops. Total cropland data was derived and compiled using annual County Agricultural Commissioners' Reports, published by the USDA. Livestock pasture and nursery products were excluded from total cropland data. A land share elasticity table was used to reflect price elasticity substitutes and complements between these crops.

From 2000-2020, total cropland in the San Joaquin Valley remained consistent at about five million harvested acres. The selected specialty crops accounted for 55% of total cropland acreage in the San Joaquin Valley. In addition, over the 20 year span, total crop production remained steady at about 45.6 million tons. The selected specialty crops accounted for 26% of total production in the San Joaquin Valley. Total crop value experienced a significant increase from 2000 to 2020. Total crop value in 2000 was \$9 billion and in 2020 it was \$23.7 billion. The selected specialty crops accounted for 75% of total crop value in the San Joaquin Valley.

Factors such as government regulations, environmental conditions, and technology advancements are a few of the many impacts of the significant differences in land allocation decisions from 2000-2020.

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Chemistry and Biochemistry

Homogenous gold(I)-catalyzed cyclization reactions in water using TPGS-750-M for the synthesis of 2-substituted benzo[b]thiophenes

Historically, water has been thought of as a poor choice of solvent for organic synthesis because of low solubility of organic molecules in water and the detrimental effect of water on both catalyst and organometallic reagents. Organic synthesis that relies exclusively on petroleum-based solvents is not sustainable and is the main contributor to hazardous waste generated during the chemical process. These problems have led researchers to rethink their position on water and attempt to recruit this solvent as an organic reaction medium instead. A transition in this regard would align better with the twelve principles of green chemistry, by creating less waste and utilizing more renewable materials for chemical reactions. In pursuit of this goal, designer surfactants like TPGS-750-M are utilized to create micelles that are soluble in water due to their hydrophilic outer shell. Their non-polar internal core, to which organic molecules are drawn, is a perfect environment for reactions to take place. This method has been successful for several named reactions including Pd-catalyzed cross-coupling and cross-metathesis reactions. With these findings in mind, we set out to convert gold(I)-catalyzed cyclization of 2-alkynylthioanisoles to 2-substituted benzo[b]thiophenes to run in water rather than organic solvents. These benzo[b]thiophenes are useful scaffolds for many pharmaceuticals including Raloxifene (treatment of osteoporosis) and Sertaconazole (antifungal). This was accomplished through optimization of various reaction conditions, including gold(I)-catalyst design, surfactant and additive choice, reaction time, and temperature.

One major finding from our optimization is the effectiveness of fluorinated additives over their non-fluorinated analogs for catalyst turnover. The use of catalysts utilizing the BIAN-NHC (bis(imino)acenaphthene-N-heterocyclic carbene) backbone also showed surprising effectiveness for this water-based process with different counter-ions offering another level of control. We have been able to achieve efficient gold(I)-catalyzed cyclization reactions of 2-alkynylthioanisoles to 2-substituted benzo[b]thiophenes in aqueous medium.

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ncorporating 3D-Printer models in TBL Applications to Enhance Learning

Introduction: Academic fields of study that engage with artifacts, cellular and anatomical structures can benefit from 3D printing technologies. 3D models offer innovative ways to engage with content to foster retention and learners' engagement.

Methods: We provide an example of an application exercise custom designed for a system-based first-year course. This application exercise is based on Team-Based Learning (TBL), the approach currently used in our Institution. We provide an example of the following TBL components: Learning objective, selected pre-work material, and a cell-biology-focused application exercise demonstrating the use of a 3D model to give students new learning perspectives.

Results: TBL application exercises provide a unique opportunity to incorporate 3D-printed models using real-life scenarios to create engaging hands-on learning experiences.

Discussion: Integrating 3D-printed models in application exercises provides a unique opportunity for hands-on learning experiences that enhances the critical-thinking skills of students and foster their understanding of the cell structure and composition of its proteins. Additionally, it provides an opportunity to visualize the components of the cell, which fosters students' retention.

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Construction Management

Factors Contributing to Success: Self-Performing Framing and Drywall Scopes on a Construction Project

Delivering construction projects on time and within budget is an essential goal for the construction firms. To meet these goals, some construction firms tend to self-perform in some scope of the project, as it enhances project performance such as safety, quality, and bottom line. In this changing trend, it is critical to understand the characteristics that contribute to the success of self-perform scopes of construction projects, and there are limited literatures available.

This study addresses that gap by conducting qualitative interviews with construction project professionals working with self-performing teams at the general contractors. The research team selected a large general contracting firm that performs construction work across the U.S. and conducted interviews with several self-perform teams that work on construction projects across the nation. Thematic Analysis was performed to identify the themes from the qualitative data.

The results identified that effective communication between general contractors and self-perform teams, effective general contractor planning and scheduling, dedicated supervision efforts from the self-perform team, hands-on experience of general contractor superintendent on self-perform trades, and trustworthy relationship between the general contractor and self-perform teams play an important role in the success of self-perform scopes of the projects.

Understanding self-perform project success characteristics can assist contractors in generating new insights to increase efficiencies and revenues on construction projects.

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Chemistry and Biochemistry

Characterization by NMR spectroscopy and Investigation of Antimicrobial Properties for a Heptapeptide Library Designed with Basic and Acidic Side Chain Residues

Antimicrobial peptides and peptidomimetics aid in the development of antibiotics and drug therapeutics. The peptide motif alanine-lysine-valine-glycine (AKVG) is secreted by amphibians, inhibiting filamentous fungi and yeasts by membrane lysis. As a continuation from earlier work where the motif EVL (glutamic acid-valine-leucine) showed evolutionary lineage within an acidic heptapeptide library, we wanted to further the investigation with heptapeptides having combinations of either acidic/basic or a combination of both side chain residues and exploring their potential to function as antimicrobial peptides (AMPs). By replacing the second and fifth residues with acidic or basic side chains, we can confirm whether those residues are more prone to AMP activity. The peptide AKVAKVG and similar derivatives were synthesized on a microwave-assisted peptide synthesizer. Kirby-Bauer Assays on gram-positive bacteria were performed to understand an association between the structure of the peptide and its antimicrobial activity. A heptapeptide library was synthesized with point mutations at the fourth residue with leucine, glycine, and phenylalanine. The AKVLKVG peptide exhibited inhibition against *Staphylococcus epidermidis*, with an average zone of 1896.33 μm , while the others revealed no activity. Positively charged side chains of lysine can interact with the negatively charged phospholipid membrane, and likely play a pivotal role within the sequence that leads to the observed inhibition. Favorable residues are passed down for the survival of certain species, such as amphibians, that secrete these natural peptides with antimicrobial activity. The peptides: AKVAKVG, AOVAEVLG, AEVAOVLG, and ARVARVLG have been characterized by Nuclear Magnetic Resonance (NMR) to understand the behavior of peptides in solution with basic and acidic or a combination of both residues. A continuation of the Kirby-Bauer Assay for these peptides will increase our understanding of the influence of these residues on dynamic interactions and antimicrobial properties in developing effective peptidomimetics.

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Biology

The Effects of Methyl Farnesoate on Gonadosomatic Indices in the Porcelain Crab *Petrolisthes cinctipes*

Methyl farnesoate (MF) (sesquiterpenoid) is involved in the development and reproduction in crustacean species. In this study the role of MF in anomuran reproduction was investigated. Four MF concentrations (10 fg, 30 fg, 100 fg & 300 fg) were evaluated in the flat porcelain crab, *Petrolisthes cinctipes*. *P. cinctipes* is an anomuran decapod that resides in the upper intertidal zone of the rocky intertidal. Gonadosomatic index (GSI) was used as the reproductive parameter to analyze the effects of the MF treatments in *P. cinctipes*. Compared to the control, crabs injected with 100 fg and 300 fg increased in GSI level. However, at 10 fg and 30 fg MF did not have an effect GSI levels in *P. cinctipes*. These results show that extremely small quantities of MF are having a significant effect in *P. cinctipes* GSI levels, suggesting that MF does play a role in regulating crustacean reproduction.

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Nursing

Central Line Dressing Application Procedure and Documentation Compliance on an Inpatient Pediatric Oncology Unit

Background: Inconsistencies and differences were found in the documentation of central line dressing changes in the electronic health record of an inpatient pediatric oncology unit. Previous research has linked improper documentation as a threat to patient safety and identified infections as one of the most common complications of central lines.

Objective: The purpose of this study is to explore compliance issues related to following the policies and procedures for central line dressing application procedure and documentation. This study is also aimed to identify areas that may need improvement on this unit. It is important to address this topic to fill gaps in previous research, but also to implement strategies to ensure patient safety is not compromised including preventing central line infections. This study intends to determine if there is a need for staff education or a policy change to indicate how to document central line dressing changes.

Methodology: Through a quality improvement retrospective chart review, that charts from every patient who received a central line dressing change during 30 days were examined. We did not account for central line dressing changes that were done outside the unit or that occurred before or after the 30 days.

Results: The results of this study are still pending.

Conclusion: Pending results following data collection. Data collection will conclude on February 28th, 2023.

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Psychology

Observing the Effects of Group Work and Content Connection in CHEM 1A classes

The purpose of the current study is to investigate the effects of module group work and course content connection by using data from Chemistry (CHEM) 1A lecture courses from Fall 2017 onwards. Student passing rate (SPR) is defined as the percentage of students passing a class course with a C-grade or better. The effects on SPR were observed within select CHEM 1A classes from California State University, Fresno. A longitudinal, quasi-experimental group design was used for the current study. Archival data of CHEM 1A course sections, instructors, student enrollment, grades, and passing rates were collected and observed for further analysis. Three instructors from the chemistry department implemented the intervention, which began in Fall 2020. The intervention involved weekly module playlists shared with students, which focused on building connections between learning objectives and group work. Pass rates were examined among 506 students from before Fall 2020, and 1,107 students from Fall 2020 and onwards. Archival data of 1,613 total students were collected and analyzed between the three instructors. Before the intervention, CHEM 1A SPR between the three instructors ranged from 19% to 85% (m=53%). After the intervention, the pass rates ranged from 53% to 79% (m=64%). It appears the intervention is somewhat effective in improving pass rates for CHEM 1A lectures. Results suggest that connecting course content and promoting group work can improve student classroom performances and delivery of content by instructors.

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Chemistry and Biochemistry

Effects of Bcl-xL expression on Glucose Metabolism and Growth Rate of the brewer's yeast *Saccharomyces cerevisiae*

Apoptosis, also known as programmed cell death, is when multicellular organisms structurally remove unhealthy cells that disrupt homeostasis that is maintained throughout the body. When apoptosis is inhibited, this can lead to the development of some forms of cancer. One of the specific changes in the cancer cells' glucose metabolism is a shift towards lactic fermentation known as the Warburg effect. Of note, the proto-oncogene *bcl-xl*, which encodes for an anti-apoptotic protein, tends to be overexpressed in cancer types showing a Warburg effect. When glucose is consumed by the yeast *Saccharomyces cerevisiae*, an innate metabolic shift can be commonly observed. This metabolic shift, called the diauxic shift, is a progressive metabolic transition from fermentation to oxidative phosphorylation when glucose has been depleted from the growth medium.

In this study, we are looking at the metabolic orientation of Brewer's yeast in response to the overexpression of Bcl-xL by using isotopically ¹³C labeled glucose. This allows for simultaneous identification and monitoring of glucose and glucose-derived fermentative product metabolites (such as ethanol) concentration over time using ¹³C Nuclear Magnetic Resonance (NMR) spectroscopy. This technique, coupled with concurrent measurements of the optical density at 600 nm (OD₆₀₀) of the cell suspension, allows to define specific relations between cell growth and carbohydrate metabolism for each yeast strain tested.

In our preliminary study, we determined that the doubling time of yeast cells in liquid high-glucose minimal media is not affected by Bcl-xL expression. This doubling time remained around 1.8 hours for the wild type (W303-2n) and the Bcl-xL transformed yeast cells. The fluxes of glucose consumption and ethanol production of these two yeast strains were also determined. Our preliminary results indicate that the fluxes of glucose consumption and ethanol production are not affected by the expression of the Bcl-xL proto-oncogene.

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Chemistry and Biochemistry

Comparing the Rate of Hydrophobic Recovery of Nonthermal Oxygen Plasma treated PEEK to PEG-functionalized PEEK in Air Aged and Aqueous Aged Environments

Polyether ether ketone (PEEK) is a polymer that gained popularity for biomedical applications and is used as a implant material with orthopedic applications. Low adhesion properties from it's hydrophobic surface limits usage due to poor osseointegration leading to worse clinical outcomes. One way to improve osseointegration of PEEK implants is by modifying the surface chemistry via nonthermal plasma treatments that add reactive polar species to the polymer. An issue with plasma treated polymers is the modified polymer hydrophilicity is transient, decreasing over time. This phenomenon is referred to as hydrophobic recovery. A promising technique to limit hydrophobic recovery is functionalization a polymer surface via nonthermal oxygen plasma followed by covalently binding of a polar molecule. Polyethylene glycol (PEG) has been successfully bound to polymers via this method. This study seeks to expand applications of PEEK implants by determining how hydrophobic recovery of nonthermal oxygen plasma treated PEEK surfaces and PEG-functionalized PEEK surfaces in both air aged and aqueous aged environments differ. Results will provide insight on if covalent binding of PEG to PEEK limits hydrophobic recovery..

For this experiment PEEK was cut into 3 cm x 1 cm rectangles and divided into 6 groups: oxygen plasma treated air aged, oxygen plasma treated PBS aged, PEG-functionalized air aged, PEG-functionalized PBS aged, PEG-incubated air aged, and PEG-incubated PBS aged. The latter two groups served as controls and comparisons were made between aging intervals (0,1,3,5,10 days) of the other groups. Oxygen plasma treatment parameters stayed consisted between experimental groups ($P=30$ W, $p = 30$ mTorr, time exposed = 180 s). The degree of hydrophobic recovery was analyzed via surface wettability using water contact angle goniometry. Preliminary results demonstrated decreased hydrophobic recovery of PEG-functionalized surfaces when compared to oxygen plasma treated surfaces in both air aged and aqueous conditions.

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