Observations of Morphological Differences in Faba Bean Plots Based on the Effect of Different Weed Management Practices

Consuelo Baez Vega

Faba beans (*Vicia faba*) are protein rich leguminous crops well known for their high nitrogen fixating properties, making them desirable for sustainable practices such as crop rotations and cover cropping. An important aspect of nitrogen fixation is nodule formation on roots of legume plants since this is where nitrogen conversion from an unavailable form to an available form occurs. The drawback to this beneficial crop is that it is a poor weed competitor, which could lead to loss in crop yield. A field experiment was conducted in Chico, CA (February and June 2020) to examine the faba beans' morphology with different weed management practices. The treatments included single applications of herbicide, mechanical, flame, and control group, while mixed treatments were mechanical and herbicide, mechanical and flame, flame and herbicide, and mechanical, flame and herbicide. The mixed treatment's purpose was to observe the benefits of integrated pest management. Each treatment and control consisted of four replications, placed randomly in thirty-six plots consisting of two faba bean rows per plot. Herbicide treatments were applied once prior to germination while mechanical and flame treatments were applied several times throughout the experiment. Morphology data collected according to treatment practices included plant height, biomass, and nodule count. It was determined that there was a significant difference in height and biomass based on the treatment implemented, particularly the use of treatments involving flame. Analyses on nodule count is currently being conducted where there was less nodule presence in herbicide related treatments, however future findings will reveal more data. The study found single flame treatment was a more effective weed management as it yielded the greatest biomass and second greatest plant height. Alternatively, combination of mechanical and flame yielded the second greatest biomass while single mechanical treatment yielded the third greatest height. It is valuable to know what type of weed management should be applied for faba beans to flourish in a less competitive environment. A repetition of this study, including pod production comparisons, would be beneficial to gather more data on the best weed management practice for faba beans.

The Effect of the COVID-19 Pandemic on Perceptions of Loneliness and Isolation in Older Adults

Allison Cardwell

Prior studies indicate that older adults who are already isolated show negative impacts to both their mental and physical health. The purpose of this study was to reach out to older adults during the pandemic and see if the extreme isolation individuals were under during this time of great hardship, had any effects on their perceived emotional well-being. Previous research on this subject helped form one hypothesis: the more isolated older adults were, the lonelier they would feel. A convenience sample from the Multipurpose Senior Services Program, or MSSP, was used. This is a program under the parent agency, Passages, the Area Agency on Aging. A paper survey was sent to 160 participants and a total of 72 were utilized. Two established, well-validated tools were used in the survey: the UCLA Loneliness

scale and the Lubben-6 Isolation Scale. The third scale was created of three questions regarding contraction of COVID-19. This was an assessment for anxiety toward potential. The results suggested a statistically significant correlation between a low Lubben-6 score (isolation) and a high UCLA score (loneliness), which validated the hypothesis that older adults, with small to no support systems in place, felt greater levels of perceived loneliness. There was also a significant correlation between a high UCLA score for loneliness and a high COVID-19 score. Participants who were lonely were also anxious about contracting the virus. Researchers must continue to explore the world of older adults. As Baby Boomers retire, they will utilize more services such as health care. This will change the economy, families, the job market, the environment, housing, and almost every area of life. For programs like MSSP, research findings recommend getting lonely people together for activities like outings to the coffee shop, a phone buddy or other ventures to create friendships. This study found older adults suffered greater levels of anxiety due to the Pandemic, yet it is unclear if Covid-19 is to blame for the isolation and loneliness scores as well. Clearly more research is needed. One solution is greater human connections. Time spent together is a life well lived.

Pentachlorophenol has Significant Adverse Effects on Hematopoietic and Immune System Development in Zebrafish (Danio rerio)

William Dowell and Aleeza Namit

In November 2018, the Camp Fire devastated the mountain community of Paradise, CA. The burning of plastic pipes, wiring, construction materials, paint, and car batteries released toxic chemicals into the environment, contaminating the air, soil, and local waterways. Examples of toxins that were identified in the creeks and waterways in and around Paradise included pentachlorophenol (PCP), chrysene, and polyaromatic hydrocarbons. The effects of some of these chemicals on embryonic development, hematopoiesis (blood formation), and the immune system have not been thoroughly studied. Defining safe levels and the long-term effect of exposure is imperative to understanding and mitigating potential negative outcomes. To perform these studies, researchers utilized zebrafish (*Danio rerio*), a commonly used vertebrate model system to study development. Following collection of transgenic zebrafish embryos and administration of varying concentrations of PCP, researchers observed the adverse effects of PCP on hematopoiesis. Transgenic zebrafish were used in conjunction with fluorescence microscopy as a means to visualize specific blood cell types in developing zebrafish. Data collected from these observations suggest that increased concentrations of PCP decreased the numbers of normal red blood cells and myeloid cells. Additionally, this study found that animal survival decreased in response to increasing concentrations of PCP. Furthermore, the prevalence of characteristic physical deformities such as pericardial edema and severe tail curvature were greater in the treatment groups. Although PCP has not previously been tied to birth defects, these data may warrant future investigation into the effect PCP has on other areas of embryonic development. Lastly, expression of *runx1*, a transcriptional regulator expressed during the second wave of hematopoiesis, was reduced in fish treated with PCP. These results suggest that PCP has a previously underappreciated effect on blood andimmune cell development and future studies should be performed to determine the molecular mechanisms involved. However, more broadly, this study provides a basis for further investigation into the unforeseen risks that

exposure to chemicals liberated during wildfires may pose to human health.

Carbon Sequestration Through Biochar Production as a Sustainable Agricultural Practice

Armin Fazlic

Throughout conducting research and development in the field of biochar production from agricultural and environmental wood waste, biochar has proven to be a viable method of carbon sequestration given adequate scaling. Biochar production in an anaerobic or a decreased oxygen environment can achieve a clean wood burn with less carbon output. The purpose of precise burn control is to have adequate safety in place for the operator, and to stop the burn at a stage where biomass has been converted to high-quality biochar, a high purity carbon charcoal. By maintaining the carbon in a macroscopic physical form, we can eliminate roughly 50 percent of waste by volume, while maintaining a low carbon footprint. Data analysis is in progress through collection of samples from different burn units, which will be compared to other biochar samples to determine moisture variability, biochar's mass, and life cycle. Positive results are expected of biochar, with high porosity and high carbon purity. Weight reduction of carbon will vary based on its moisture content in wood material. The primary focus of current research is on orchard long-term utilization as a soil amendment. When different amounts of biochar were mixed into soil, it has shown positive impacts on the crop's health and yield. Biochar has hygroscopic qualities allowing it to behave like a form of water storage when water is scarce, which plants are readily capable of absorbing. Small cavitation formed in the burning process called pores in biochar have further shown evidence to behave as microbiomes allowing for microbial life to live inside, consume and recycle surrounding nutrients. This cycle can remain continuous for as long as the biochar maintains its integrity, and ultimately produces nutrients for plant life to consume as the biochar begins to go through various physical and chemical changes. As agricultural crops finish their life cycle, we propose this biomass to be processed and converted into biochar, and farmers reintroduce it into soil for next crop's consumption. This cycle can ultimately sequester carbon, preserve water, and decrease fertilizer impact on runoff contributing to undesirable eutrophication in natural waterways.

Caffeine Use Disorder: Associations with Impulsive and Risk-Taking Behavior

Natalia Garcia

Recently there has been debate whether it is appropriate to add Caffeine Use Disorder to the next publication of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM). The aim of this study was to determine if past week caffeine consumption (mg/week) is associated with higher impulsive and risk-taking behavior. This study also aimed to determine if higher Caffeine Use Disorder scores are associated with higher impulsive and risk-taking behavior. First, participants completed a demographics questionnaire. Those indicating past year drug use completed the DSM-IV Substance Use Criteria and the proposed criteria for Caffeine Use Disorder. Participants who reported past weekly caffeine use also completed the Caffeine Consumption Questionnaire. Next, participants responded to three tasks. First was a personality-based assessment known as the Barratt Impulsiveness Scale version-11. Then, a Probability Discounting Task (PDT) and a Delay Discounting Task (DDT); these tasks were counterbalanced. The PDT was

used to measure risk-taking behavior of participants, and the DDT was used to measure impulsivity among participants. Upon completion of the survey participants were debriefed. Final sample size consisted of n=166 participants. Results were interpreted using a multiple regression analysis with backwards elimination. There was a total of 5 backward regressions, each including the same predictor variables. The research found that the PDT, DDT, and BIS-11 second order factor of attention yielded no significant associations after final analysis. The second order factor of motor yielded a positive significant association with the predictor variable age, suggesting older participants scored higher on motoric impulsivity. The second order factor non-planning also yielded a significant positive association with total caffeine consumption, suggesting higher caffeine consumption totals were associated with higher non-planning behavior. This second order factor also yielded a second significant association with the predictor variable DSM caffeine score. This association was negative, suggesting lower criteria met for Caffeine Use Disorder was associated with higher non-planning behavior. Overall, the findings entail that total caffeine consumption may be the better indicator of behavior disruption; this is valuable information when determining criteria to include for Caffeine Use Disorder.

Multiscale Simulation of DNA Nanostructures for Drug Delivery

Greg C. Gutierrez and Michelle Gomez

Design and synthesis of systems the operate at nanometer length scales and incorporate the unique properties of deoxyribonucleic acid (DNA) has emerged the field of DNA nanotechnology. Recently, structural DNA nanotechnology has found various applications in a variety of fields spanning energy harvesting to nano-theranostics. For drug delivery, one objective is to determine whether DNA can act as a suitable molecular container, capable of delivering drugs without rupturing. Here, we present the scaffold design for four specific three-dimensional nanostructures including a box, two variations of a triangular prism, and a multi-chamber triangular prism. Each of these nanostructures is designed to facilitate the encapsulation, transport, and dispersion of specific drugs at targeted locations within the human body. The size and geometries of each structure were chosen based on the ability to fully encapsulate a varied range of drug sizes. Both thermodynamic and mechanical stability of these structures within an environment that mimics thehuman body is demonstrated via molecular dynamics and finite element analysis simulations of each structure, respectively. Thermodynamic stability implies that the structures will stay intact while under the pressure, temperature, and chemical combinations they would experience inside the body. Similarly, mechanical stability addresses external forces within the human body will not damage the structures. These results indicate that these structures could very likely be candidates for drug delivery vessels. Further research will be performed to simulate the interaction of more molecules within the nanostructures described above. Experimental synthesis would then be the next goal.

COVID-19 and Structural Violence in America: The Case of Blue Collar Latinx Workers in the Meat-Packing Industry

Daisy Linsangan and Magaly Quinteros

This ongoing ethnographic study focuses on Latinx meat-packing industry workers in the San Joaquin Valley who are physically, socially, and economically affected by the COVID-19 pandemic. Statistics on COVID-

19 pandemic infections and deaths in the United States reveal that minority populations, including African Americans and Latinx individuals, are significantly impacted. This study attempts to analyze how COVID-19 entered meat packing facilities, how it affected the livelihood of thousands of Latinx meat packing workers, and what social, economic, psychological, and physical challenges they faced. The Principal Investigator (PI) and secondary investigators will continue to examine how the global pandemic both highlights and contributes to the threat of a Central Valley Latinx community's well-being. A structural violence framework will be applied to analyze how the inequities and injustices embedded in social and institutional structures within American society have affected Latinx meatpacking workers and worsened conditions during the time of COVID-19. As of April 2021, three Latinx meat packing employees of the Central Valley Meatplant (CVM) were interviewed. The investigators observed similarities in the workers accounts regarding how their employer lacked to provide adequate COVID-19 safety protocols and how they were mistreated by human resource management. When put into the framework of structural violence, their livelihood has been physically, economically, and psychologically disrupted by the disease and is worsened by political and economic schemes by their employers, the Trump administration, and policies and practices of public health and immigration. This study can provide a platform for Latinx meat packing workers to voice their experiences of marginalization, to advocate for workers' rights and to provide a thorough understanding of how American institutions perpetuate marginalization. This study was impacted by COVID-19 restrictions because of IRB restrictions the entire study was conducted virtually. Further in person investigation is needed; possible recommendations include in person participant observation, gathering data from more interviewees, and exploring the perspectives of those higher up in the hierarchy of the meat industry.

The Impact of Covid-19 on Latinx Families in California

Alejandra Moreno, Daisy Cedillo, and Veronica Lopez

Previous research indicates that Latinx individuals may face unique barriers to employment, education, and access to resources due to language barriers and immigration status. The circumstances of the Covid-19 Pandemic heightened already existing inequalities for many individuals and essential workers faced additional risks of contracting Covid-19. The purpose of this study was to explore the impact of the Covid-19 Pandemic on Latinx families in California in July 2020. Adult participants (n=125) identifying as Latinx were recruited throughout California using snowball sampling methods in English and Spanish. A mixed-methods survey with questions surrounding childcare, employment, financial burdens, education, and access to resources. The results of the questionnaire found changes in childcare for families with young children during the pandemic. From the results, most families had to provide childcare for themselves. Statistically significant findings surrounding education identified that being a college student predicted changing residences. College students were more likely to move back to their hometown due to the cancellation of in person classes, the loss of employment because of the closure of business, and not being financially able to pay for their apartments, encouraging their moves back home. In regard to employment, results showed that it was more likely that a

participant lost their job during the national lockdown. Only a few participants were classified as an essential worker where they got to keep the employment that they had prior to the lockdown. Findings also showed financial worry was the most common difficulty. One of the reasons was the access to resources. Participants felt that they were not properly prepared for the pandemic and were not given the right resources to help combat the experience. As the pandemic was a rapidly evolving event, findings were limited in this cross-sectional study. Preliminary results generated additional research questions for further inquiry and recommended follow-up studies regarding educational impacts to children, long-term impacts of loss of employment, impacts specific to college students, and reasons for household composition change for Latinx families as the result of the Covid-19 Pandemic.

mustn1a **is Essential for Normal Vertebrate Hematopoiesis**

Aleeza Namit

Hematopoiesis (blood formation) is the differentiation of adult stem cells called hematopoietic stem cells (HSCs) into the multitude of blood cells present in the body. This biological process is vital in the early developing embryo and is sustained throughout an organism's lifetime. Our research laboratory uses the *Danio rerio* (zebrafish) model to explore hematopoietic and immune system development and has successfully identified 447 genes thought to be important for these processes. Of these genes, *mustn1a* (musculoskeletal, embryonic nuclear protein 1a) had high expression in areas of hematopoiesis, indicating that its presence and function is vital to this process. Understanding the role of *mustn1a* in hematopoiesis in zebrafish can better our understanding of the evolutionary history behind this process in all vertebrates. To elucidate the role of *mustn1a* in blood formation, expression of the gene was knocked down in developing zebrafish embryos using *mustn1a*-specific morpholino (MO). MOs are molecules that target the translational start site for *mustn1a*, preventing the mRNA from being translated and the protein from being made. Newly fertilized eggs were harvested and injected with MO via microneedle injections at the single-cell-stage. By inhibiting the gene's expression in this way, the resulting deleterious effects on hematopoietic development were assessed. Thus far, knockdown of this gene results in a reduction of neutrophils, erythrocytes, and thrombocytes in developing zebrafish. These observations were made with transgenic zebrafish, which have specific fluorescent tags for each of these cell types. The knockdown of this gene also resulted in body axis deformities in the zebrafish morphants. From previous studies we know that this gene is important for condensation of mesenchyme (an early embryonic tissue) to form cartilage and bone, and our observations give us reason to think it is involved in mesodermal differentiation (blood is derived from mesoderm, too). In essence, *mustn1a* is important for zebrafish hematopoiesis as well as formation of other mesodermal structures.

California State University, Chico

Students' Attitude Towards the News

Roxzel Soto Tellez

Studies have shown that overt partisan news networks, the sensationalization of news stories, and misinformation caused trust in the news to decline. The term "fake news" raised news outlets' credibility and instigated further ideological polarization. This research aimed to determine the external factors that influence the manner one

interprets the news. The study focuses on the various aspects and biases that affect attitude and perception of the news. Surveys were sent via email to two thousand ninety-three randomly selected California State University, Chico students. One hundred and eighteen students responded to the survey regarding their consumption, perception, and interpretation of the news. The quantitative data was examined to find variables that influenced student's perception of the news. Preliminary analysis suggested that CSU, Chico students feel strongly about several issues, including police brutality of minorities not being reported in the news, racial and ethnic representation in the news, and Blue Lives Matter. The research found many strong relationships between variables affecting student's attitudes toward the news. A correlation that stood out was students with a very favorable opinion of Trump supporters had a significantly higher level of agreement that racial discrimination by law enforcement is not as bad as the media portrays, than students with an unfavorable opinion of Trump supporters. The finding demonstrated another strong correlation among white students being more likely to agree that their race was portrayed positively in the news than students of color. Further research with more participants would provide a better overview to comprehend influences that affect perception of the news. Implications of the study are that news media literacy to recognize one's own biases and partiality in news stories would benefit CSU, Chico students. Training for news literacy may provide students with the tools to identify bias and encourage critical thinking about information in the news.

Body Image and its Effects on Male and Female Ethnic-Minority Adolescents

Vicky Wong

Adolescents associate their body image as part of their identity, however having a negative body image can lead to an increased risk for developing severe body image disturbances and eating disorders. Not much research on body image has focused solely on ethnic-minority adolescents in a school setting. It would be advantageous to understand more about this population and their relationship with body image. The current study investigated the relationship between ethnic-minority middle school and high school students' intrapersonal and interpersonal functioning with their views and feelings towards body image. A total of 189 ethnic-minority adolescent students completed several questionnaire surveys: Eating Attitudes Test-18 (EAT-18), Multidimensional Body-Self Relations Questionnaire – Appearance Scale (MBSRQ-AS) and Social Emotional Health Survey – Secondary (SEHS-S). The Latent Profile Analysis (LPA) approach was used to find and draw out possible similarities and differences from individuals based on their responses and create distinct memberships of those with similar profiles. A 3-class membership emerged: 1) Low Appearance Satisfaction/Low Appearance Maintenance (LO); 2) High Appearance Satisfaction/Low Appearance Maintenance (Hi Sat/Lo Ma); and 3) Low Appearance Satisfaction/High Appearance Maintenance (Lo Sat/Hi Ma). Grade level was not a covariate. The Hi Sat/Lo Ma profile reported the healthiest attitudes and behaviors towards body image and most likely to have a membership of males compared to both LO and Lo Sat/Hi Ma profiles. The LO profile had the lowest body and appearance satisfaction and most likely to have a membership of females compared to both Hi Sat/Lo Ma and Lo

Sat/Hi Ma profiles. Factors such as perceived social support and self-esteem are linked to body image. These findings support the proposal that screening, prevention efforts and early intervention should be provided for all students, especially ethnic-minority students, in a school setting as it can help to reduce challenges in receiving help from professionals. Helping students gain media literacy and develop positive body image are some ways to help students with body image and promote healthy attitudes, behaviors, and practices.

COVID-19 & Student Basic Needs: Understanding Impacts of the Disruption and CARES Emergency Funding

Tatiana Ybarra, Suyet Peralta, Daniel Celis, and Mariela Cuna

This project utilized a student research team to conduct focus groups among students who received the CARES ACT emergency grant. The CARES act was funded in April 2020 from the US Department of Education with $6 billion for universities and authorized by the Coronavirus, Aid, Relief, and Economy Security Act. The purpose of this study was to collect and advocate on behalf of the student population to facility administrators to better understand the disruptions of the pandemic. We sought to better understand the impact of COVID-19 on food security, housing insecurity and homelessness on student success. In an effort to draw a sample of students who had experienced some recent financial challenges, the research team utilized a list of 469 students and from that list a total of 26 students participated. A large portion of the study population received the first, second or both of the CARES funds distribution. The several group interviews were held on Zoom and recorded and transcribed on Otter. Following the coding, the team conducted a thematic analysis with findings that have affected their lives during the pandemic as a student. It was clear that for many students, while families are a strong support system, at times their limited resources became an added stress for students both financially and emotionally. We found repetitive themes overlapping such as loss of employment, negative impacts on mental health, additional support for student resources, and one that stood out which was lack of diverse representation of facility. The implications of this study found that while the CARES distribution was a great resource there were other factors that affected the lifestyle of students that need additional support.