AAAS and Center for Biology and Society

2021 Meeting

Due to the unique situation our international scientific community finds ourselves in, AAAS 2021 created an entirely **virtual experience** for the <u>2021 AAAS Annual Meeting</u>: <u>Understanding</u> <u>Dynamic Ecosystems</u> with a new format making the online program and e-poster presentations available to a larger audience.

The **Center for Biology and Society** along with **Barrett, The Honors College** were excited to support ASU sponsorship of the 2021 AAAS Meeting. We offered grants to cover e-poster submission and registration fees along with e-poster and presentation guidance for 36 ASU undergrad and graduate students.

2021 AAAS Students



Where Do Instructors Come From? An Analysis of Influential Institutions on Faculty

Anna Abraham

Abstract

Even though the benefits of active learning are well established, most instruction in undergraduate STEM continues to be predominantly lecture-based, and large-scale pedagogical change has proven hard to achieve. It is often cited that instructors teach the way they were taught. If true, where instructors received their undergraduate and graduate training can provide insight about which universities influence current teaching practices of instructors. This information has implications for where pedagogical reforms would make the greatest long-term impact. To address this guestion, we explore patterns in where physics faculty received their undergraduate and graduate training. We collected data on tenure-track physics faculty from 579 universities in the US, resulting in a data set of 7676 tenure-track faculty, including where they currently work, where they earned their PhD, and where they earned their undergraduate degree. These data were used to create professionalization networks that connect universities by where professors earned their degrees to where they currently work. These networks show core-periphery structures, where a smaller number of highly influential

institutions are tightly connected to one another in the core of the network, but also are responsible for training a majority of the faculty who work at universities in the periphery. This suggests that schools in the core may be particularly influential for creating large-scale change, as they have the strongest professionalizing influence over the entire network. Importantly, universities outside of the US have a large impact on the professionalization network; 44.4% of tenure-track physics faculty earned at least one of their degrees outside of the US. While these faculty come from 101 different countries, universities from China, India, Russia, Germany, England, and Canada are responsible for granting undergraduate degrees to 20% of all tenure-track faculty, and PhDs to 11.8% of all faculty. The abundance of faculty who received their disciplinary training outside of the US has important implications for large-scale pedagogical change and higher education. Nationally targeted interventions to provide evidence-based pedagogical training to future faculty, like reformed graduate training, will not be sufficient to train the full candidate pool for faculty positions. Further, this raises guestions about how academic preparation varies internationally, and whether differences in training result in different pedagogical choices once someone becomes faculty in the US.



Cancer Nanomedicine Project

Abraham Alfred

Abstract

The purpose of this project is to analyze the current state of cancer nanomedicine and its challenges. Cancer is the second most deadly illness in the United States after heart disease. Nanomedicine, the use of materials between 1 and 100 nm to for the purpose of addressing healthcare-related problems, is particularly suited for treating it since nanoparticles have properties such as high surface area-to-volume ratios and favorable drug release profiles that make them more suitable for tasks such as consistent drug delivery to tumor tissue. The questions posed are: What are the current nanomedical treatments for cancer? What are the technical, social, and legal challenges related to nanomedical treatments and how can

they be overcome? To answer the questions mentioned above, information from several scientific papers on nanomedical treatments for cancer as well as from social science journals was synthesized. The results are as follows: nanomedicine has a wide range of applications that include not just cancer drug delivery but also cancer immunotherapy and detection. The main technical challenge related to nanomedical treatments is navigating through biological barriers such as the mononuclear phagocyte system, the kidney, the blood-brain barrier, and the tumor microenvironment. Current approaches to meeting this challenge include altering the size, shape, and charge of nanoparticles for easier passage. The main social and legal challenge related to nanomedical treatments is the difficulty of regulating them due to factors such as the near impossibility of detecting nanowaste. Current approaches to meeting this challenge include having the EPA require companies involved with nanotechnology to keep records detailing important facts about their materials especially regarding potential hazards they may pose to humans and the environment, making regulation easier. Overall, this project identifies enduring challenges and complexities in cancer nanomedicine. As we continue to make progress in fighting cancer, we must consistently (re)evaluate whether our proposed solutions match the persistent and emerging problems to ensure we are using our vast talent and resources efficiently and for good.



Sunrise On a New Future: How the Sunrise Movement is Reshaping

Abstract

Environmental activism has played a major role in American politics since the late 1800s, with major victories including the National Park Service Organic Act of 1916 that established the National Park Service to help protect parks and monuments, the Clean Air and Clean Water Acts of the 1960s and 1970s, and the phase-out of ozone depleting chemicals in the 1990s. Yet mainstream activism has struggled to engage with frontline and minority communities and generate public support. This is in part because of their perpetuation of a corporate system in which frontline and minority communities are left behind and

Environmental Activism

Madeline Alzamora

focus on traditional methods like lobbying and indirect activism. In contrast, the Sunrise Movement is a new youth-oriented environmental and social organization that has grown in size and popularity over the last five years by focusing on combating both climate change and socioeconomic inequalities through the Green New Deal. With the growing need for climate action that is fair and equitable, this project contextualizes the Sunrise Movement within past and current environmental movements as well as the current environmental and political climate in order to then investigate how Sunrise operates and their level of effectiveness in promoting the Green New Deal. I performed a literature review of both past and present (1960 to today) news articles as well as journal articles in addition to interviewing experts in the theory and practice of activism to characterize the three waves of environmentalism and lessons learned, the current political sphere and what mainstream activism is working toward, and the Sunrise Movement itself. While mainstream and localized radical activism had victories and a certain degree of effectiveness, their lack of inclusivity has failed to encourage the mass mobilization needed for long-term climate legislation. The Sunrise Movement distinguishes itself through disruptive activism and direct engagement. It is disruptive by challenging the status quo of profit over people, a two-party system where both groups are moving toward the right, and the whiteness and liberal locations of the mainstream environmental movement. Its activism is direct by working with partners across the environmental, social, and labor sphere and employing actionable, hands-on tactics that encourage participation. Their work, like all activist and political organizations, has serious limitations, but Sunrise works hard to support and encourage public enthusiasm for climate and social equity.



Get Excited!: Using Anime to Rethink Adolescent Science Education

Estefania Arellano

Finalist: Science In Society: Undergraduate Third Place

Abstract

Pedagogical researchers have explored pop culture media in educational settings in the past. However, pop culture media is always evolving, and pop culture exists in a very specific context in the lives of young people. Teachers should be aware that students have already formed their own cultural activities and work with them, rather than neglect them. Anime has remained largely unexplored in this context despite its popularity. Its animation style and storyline may provide exciting moments that are memorable to young adults. This study examines the potential of anime, a style of Japanese animation, in educating through a visual medium. Recent anime have successfully incorporated science into their storytelling. The 2017 anime, Dr. Stone, follows a high schooler and his friends as they attempt to use science to restore human society after 3,700 years of global petrification. Through qualitative analysis and coding of select episodes of Dr. Stone, this study examines the ways in which scientific concepts in engineering, chemistry and geology are taught. It also examines the significance of science and representation of scientists within its storyline. Dr. Stone presents an image of science which is interesting, relevant and understandable to adolescent students through its compelling visuals and engaging story. Through its characters, it also presents a relatable and less stereotypical image of scientists. Innovative pop culture media like anime is one way of generating interest in science among adolescents and challenging preconceived notions of science. Educators may find it useful in a classroom setting.



Abstract

Early detection of diseases is essential for alleviating disease burden, increasing success rate and decreasing mortality rate, especially for breast cancer, which is the second leading cause of death from cancer in women. Over the past decade, the advancement of technology in molecular biology and image

Evaluating Breast Cancer Biomarkers Using Sensitivity at Fixed Specificity

Danielle Brister

analysis suggest a large number of candidate biomarkers for early diagnostic purposes. Assessment of the diagnostic performance of these markers and validation of biomarkers for clinical utility is increasingly important, especially for particularly aggressive subtypes of breast cancer such as basal-like breast cancer (BLBC). BLBC is a rare molecular subtype, less likely to be detected through mammographic screening and characterized by an aggressive clinical outcome. Accurate identification of circulating biomarkers for this subtype is thus very important for detecting and managing it in the future. One of the most commonly used tools for illustrating the diagnostic ability of a biomarker in case-control studies is the receiver operating characteristics (ROC) curve. The area under the ROC curve (AUC) is used as a global measurement of biomarker performance. Partial AUC (pAUC) can also be used if a specific range of sensitivities or specificities of the biomarker is of more interest to the study; however, these two measures, AUC and pAUC, are still often guite difficult to interpret, especially for non-staticians. AUC and pAUC values can also be misleading since they equally weigh the range of clinically and clinically-irrelevant thresholds of a biomarker. We illustrate a method called sensitivity at a fixed specificity (STSP), to assess a biomarker's performance as an alternative measure to the AUC and pAUC. We designed an R code to analyze sensitivity at 90% specificity and to sort out the top 10 markers based on AUC, pAUC and STSP for a set of BLBC biomarker data. The markers that were sorted out in the top 10 of all three categories were proteins DNAJC7 and CXCL1. Other markers that sorted in the top 10 of both AUC and STSP were proteins MLF2 and OPRL1 and a marker that sorted in the top 10 of both pAUC and STSP was protein CSNK2B. Initial results indicate that STSP is comparable to AUC and pAUC in the interpretation, validation and sorting of BLBC biomarkers. The inclusion of a graphical dot plot that clearly identifies case and control groups, an ideal threshold, and corresponding test statistics, sensitivity and specificity, provides a more user-friendly output, making STSP a more convenient and efficient way to interpret biomarker data.



The Effect of Variation in Features of Exam Questions From Biology Instructors

Puja Chhetri

Finalist: Social Sciences: Undergraduate Second Place

Abstract

Student performance in instructor written high-stakes exams contributes to a significant part of the student's grade and can have important consequences, especially in "gatekeeper" introductory STEM courses. However, instructors have much autonomy over how they write exams and what kind of questions are included on exams. The goal of this research project was to examine the effect of variation in features of Introductory biology exam questions and examine the relationship between features of exam guestions and their difficulty. To assess this variation in one introductory biology, we collected 26 high stakes exams with a total of 987 questions (i.e. items) from three different introductory biology instructors/instructional teams and quantified various features of each exam guestion, including the cognitive level of the questions (Bloom's level), length of the questions, use of negative words in multiple-choice stem (e.g. "does not"), and use of figures in the question. We used the Blooming Biology Tool and Bloom's dichotomous key to categorize exam questions into six levels: knowledge, comprehension, application, analysis, synthesis, and evaluation. We used one-way ANOVA and chi-square tests in R to compare item features across instructors. Next, we used two-parameter IRT models using the ltm package in R to calculate item difficulty and discrimination. Then, we used linear regressions to assess the relationship between item features and difficulty. Although these were all exams from the same introductory biology courses, we found that there were statistically significant differences in Bloom's level, length of guestions, presence of visuals, and use of negative words in the stem. However, we found no statistically significant relationships between these items features and item difficulty. Lack of a relationship between item features and difficulty likely indicates that instructors are preparing students to answer the sort of questions they ask on the exams. However, the wide variation in item features observed in instructor exams could have significant implications on student learning in introductory biology courses, which could influence student preparation for

upper-level biology courses.



Characterizing Cognition: The Cognitive Map Debate In Insects

Kelle Dhein

Abstract

During the latter half of the 20th century, mammalian navigation researchers established the existence of a cognitive trait in rats called the cognitive map. As scientists uncovered the neuro-cellular basis of the cognitive map in rats, insect navigation researchers began to ask whether animals like ants and honeybees might also possess a cognitive map. This poster examines an ongoing, decades long debate between two insect navigation researchers—Rüdigher Wehner and Randolf Menzel— who have become figureheads for the pro-cognitive map group and anti-cognitive map group. These competing researchers were trained in the same ethological research tradition by the same mentor at the same time, and in 1990, they agreed that ants and honeybees do not possess a cognitive map. But as the scientists continued to investigate insect navigation and develop their own prominent research programs, one scientist changed his position and began to argue that honeybees do possess a cognitive map while the second scientist continued to develop alternatives to the cognitive map. How can two scientists pursuing such similar problems within the same disciplinary context go from agreeing with each other about insect cognition to disagreeing with each other as more evidence became available? And what, if anything, can this debate teach scientists about the prospects of cognitive research converging on big picture accounts of cognitive traits that span a wide variety of taxa? In this poster, I argue that the debate does not center on whether a given process constitutes cognition or what it would take in principle for some phenomena to instantiate cognition. Rather, these scientists argue about how to characterize cognition. Are representational contents centrally processed or peripherally processed, does cognition integrate the contents or keep them distributed? I use an historical, epistemological perspective to show how the terms used to articulate these distinctions are themselves contested in nonobvious ways. Competing

research groups adhere to different evidential norms when determining whether the results of behavioral experiments justify claims about the dynamics of neural representations. Thus, there is more at stake in the debate than the truth value of propositions characterizing insect cognition. What is at stake for participants of the debate are competing constellations of epistemic aims, evidential norms, preferred animal subjects, investigative practices, and theoretical assumptions that are often orthogonal rather than conflicting.



Mislocalized Expression of Npc Proteins Nup153, -93, and -214 in Alzheimer's Disease

Miriam Goras

Abstract

Alzheimer's disease (AD) is a progressive, neurocognitive disorder characterized by memory dysfunction. The presence of neuropathological aberrations, namely amyloid plagues, and neurofibrillary tangles, although key characteristics of this disease, have shown to be poor prognostic indicators. As such, clinical trials targeting AD neuropathology have largely been unfruitful, necessitating new research into novel mechanisms of the underlying pathways mediating cognitive decline. Nuclear pore complexes (NPCs) are the main conduits for molecular exchange across the nuclear envelope in eukaryotic cells. The NPC contains approximately 30 distinct nucleoporins (NUPs) which form a selective channel that supports the factor-mediated shuttling of cargo through the NPC. Mutations in nucleoporin genes have been linked to various human diseases including neurodegenerative diseases. Tau is the major component of neurofibrillary tangles in (AD), and a recent study has suggested a role in NPC deterioration and thus nuclear-cytoplasmic defects. This study however was not an extensive one and only investigated four nucleoproteins from one layer of the NPC structure. In this study, we have targeted all three major components of the NPC structure, by analyzing gene expression of representative NUPs from homogenate brain tissue and neuronal data in AD brains. Three significantly differentially expressed NUPs (NUP-214, -93, -153), representing different parts of the NPC structure (cytoplasmic filaments, inner ring structure, nuclear basket),

were selected for validation by immunohistochemistry and Western blotting in postmortem human hippocampal sections. Bioinformatic analysis revealed widespread differential NUP gene expression across multiple brain regions in AD. These results were reflected in immunohistochemistry and immunoblotting results, which revealed quantity and localization changes of the selected NUPs in AD. Our findings revealed mislocalization of cytoplasmic-facing nucleoporin NUP214 in the cytoplasm in AD and nuclear localization of inner ring and nuclear basket nucleoporins NUP93 and NUP153 in hippocampal CA1 neurons. These results and this research represents one of the first attempts to categorize differential changes throughout the entire structure of the NPC in AD brains. Future studies will explore the hierarchical relationship between neuropathological hallmarks of AD and NPC aberrations to better understand the etiology of impaired nucleocytoplasmic transport in neurodegeneration.



Arizona University Student Perceptions to Covid-19 And The Campus' Measures Taken

Alyssa Hart

Finalist: Social Sciences: Undergraduate Third Place

Abstract

This project analyzes differences in how the four-year degree public universities in Arizona are handling COVID-19. Since the start of the academic year the number of positive cases in the age range of college students (20-35) has significantly increased. Universities are up against the generally held belief that college students are considered to be asymptomatic carriers of the coronavirus and that if they do have symptoms, they are likely to be mild. For this reason, it can be tempting for people in the age range to fail to follow safety protocols. For this project, I am looking both at what makes students feel safe and what measures might be more effective in lowering the number of cases and thus the spread of the virus. Having data to see what measures might be most effective in lowering, preventing, or stabilizing the number of cases would be really important to acknowledge in this population. Methods: I will survey and interview students from each of these universities to get an understanding of their perceptions on COVID-19, examining both their initial and current perceptions regarding

the school experience, changes made, and opinions on the university's measures. In addition, I will track how the population changes in the zip codes of each university when students are on campus to ascertain if the influx in new cases in those zip codes can be linked to the student population. The survey and interview data will allow for the collection of gualitative data about student perceptions of both COVID-19 and of their university's approach to dealing with the problem. Analyzing the influx of cases using population data and the reported number of cases will allow me to ascertain how the virus is spreading in these populations. With this data, I will be able to acknowledge the pros and cons of each university's COVID-19 protocols and procedures and make recommendations about which tactics were ultimately most effective in positively changing students' perspectives about COVID-19 and in stopping the spread of the virus on university campuses. I expect to find the number of cases between each of the universities to be similar if they are taking similar measures and that the college age group will increase the zip code of the university. With my results I anticipate I can provide recommendations for the study population and stakeholders regarding effective measures taken for COVID-19 spread.



The Evolution of Lignocellulose Digestion in Termite Protist Species

Israa Jahan

Abstract

The objective of this study is to determine the evolution of the wood-eating enzymes within termite protists by creating phylogenetic trees for each of the responsible protein families. The symbiosis between termite gut protists and their termite hosts includes the lignocellulose digestion done by the protists that are required for both organisms to acquire nutrients from wood. Termite hindgut protists are the only protists known to engulf and digest wood particles. Many of these protists contain proteins from the glycosyl hydrolase families (GHF) that hydrolyze the glycosidic bonds between carbohydrates. Previous studies have investigated protist GHFs from the perspective of termite whole gut transcriptomes. Here, we investigate GHF diversity and evolution from single cell

transcriptomes, which allows us to understand how the ability to eat wood originated and evolved in these protists, as well as which protists might be carrying out different aspects of wood digestion. For this study, single protist cell transcriptomes that were harvested from our lab were tested to see if the protists have any lignocellulose digestion proteins, or more generally, any GHF proteins, since this GHF encompasses many lignocellulose families as well. Phase 1 of the project involved a targeted BLAST search for 5 GHFs: GHF5, GHF7, GHF11, GHF10, and GHF45 because these are known to be highly expressed in the termite gut and are suspected lignocellulose digestion families. For phase 2, dbCAN (automated Carbohydrate-active enzyme Annotation) was used to determine which additional glycosyl hydrolase families can be found in each protist species' transcriptome. At the conclusion of each phase, phylogenetic trees were made for each relevant GHF with protein sequences from different protists from our own internal database and larger public databases such as dbCAN and NCBI. Our preliminary results indicate that these protein families were derived from multiple non-protist species including fungi and bacteria. Protists that do not have any wood eating abilities seem to be lacking GHF5, GHF7, GHF11, GHF10, and GHF45, consistent with their inferred role in lignocellulose digestion. However, for protists that are known to be wood eating, other families such as GHF31, GHF13, and GHF3 are consistently found within their transcriptomes. These protists therefore seem to have acquired their lignocellulose digestion enzymes from other species such as the bacteria and fungi.



Plant-Made

Abstract

The development of safe, low-cost, efficient therapeutics to treat coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), will have a pivotal role in reducing the impact of the worldwide COVID-19 pandemic. Observations of increased levels of proinflammatory molecules among patients with moderate to

Immunotherapeutic s; A Potential Treatment For Severe Covid-19

Collin Jugler

Finalist: Biochemistry And Molecular Biology: Graduate Student Third Place severe COVID-19 have been reported. Of these proinflammatory molecules, interleukin 6 (IL-6) is of interest in both that elevated levels of this molecule are correlated to disease severity and increased mortality in infected patients. Additionally, there already exist several approved therapeutics for other diseases that specifically target IL-6 signaling. We hypothesize that inhibiting IL-6 signaling will mitigate the severe symptoms often associated with COVID-19 caused by a prolonged, intense immune response, colloquially referred to as a "cytokine storm". Here, we show that sarilumab, an anti-interleukin 6 receptor α (anti-IL-6R α) antibody, can be produced in plants to high levels using Agrobacterium tumefaciens-mediated transient expression. Western blot analysis provides evidence that the anti-IL-6Ra antibody is assembled properly. An in vitro, cell-based assay shows that the plant-produced antibody retains the expected bioactivity, as displayed by a reduction in luciferase activity. Future experiments will analyze the binding kinetics of the antibody to its cognizant receptor, as well as the antibody's ability to block IL-6 signaling and reduce inflammation in an animal model. Plant-based manufacturing of this potentially useful biological drug is economically friendly and offers the opportunity to increase the affordability and availability of a low-cost treatment for those suffering from severe COVID-19.



Convergence Of The Preterm Infant Gut Virome Prior to Necrotizing Enterocolitis

Abstract

Development of the microbiome during early life is important for infant health and immunity. Necrotizing enterocolitis (NEC) is a serious, often fatal disease associated with preterm birth, characterized by intestinal inflammation and necrosis. While the etiology of NEC is poorly understood, previous studies have identified bacterial dysbiosis as a potential contributor. However, little is known about the role of the virome in NEC. Furthermore, how the virome develops in preterm infants is poorly understood. We performed metagenomic next-generation sequencing to investigate longitudinal changes in the gut viromes of 9 preterm infants who developed NEC

Emily A Kaelin

Finalist: Medicine And Public Health: Graduate Student First Place



Correlation Between Larvicide Susceptibility And Quiescence In Aedes Aegypti

Brenna Kayce

Abstract

Mosquitoes are estimated to kill roughly 700,000 people each year through the transmission of vector-borne diseases. Vector control via insecticides is a widely used method in order to combat the spread of mosquito populations; however, this comes at a cost. Resistance to insecticides has the potential to increase vector-borne disease rates. Aedes aegypti is an invasive mosquito species in Arizona and is a known potential vector for a variety of infectious diseases including zika, yellow fever, dengue, and chikungunya. In contrast to many other mosquito species Ae. aegypti mosquito eggs can undergo quiescence, an active state of dormancy, over long periods of time. Variation in guiescent periods correlates to climatic rainfall alterations and can ultimately influence hatching and mating between multiple generations. I have studied the effect of guiescence on larvicide susceptibility. Mosquito eggs were collected from a susceptible lab strain and stored under optimal temperature and humidity conditions. After undergoing various guiescent periods (3, 7, 14, and 28 days, and 3 and 6

and 14 gestational age-matched control infants. We found that intra-individual gut virome variation within infants over time was

significantly lower than inter-individual differences between

decreased significantly in the 10 days before NEC onset. In contrast, control infant beta diversity remained constant, indicating a more stable gut virome. The NEC-associated virome alteration in case infants was driven by enrichment of Myoviridae, Siphoviridae, and Podoviridae bacteriophages in a manner distinct from control infants. In contrast to virome beta diversity, bacterial microbiome beta diversity in case infants was stable in proximity to NEC onset. These findings suggest

unrelated infants, regardless of NEC status. Moreover, in

infants who developed NEC, gut virome beta diversity

that specific viral signatures in the gut of preterm infants

NEC and microbiome-based interventions for NEC.

coalesce in the days leading up to NEC. Our results could lead to early interventions for preterm infants at risk of developing

months), the experimental eggs as well as 7-day quiescent control eggs were hatched and reared to 3rd instar larvae. Temephos susceptibility was tested using the WHO bioassay procedure at lethal concentration (LC) 20, LC50, LC80, diagnostic dose (twice LC99), plus an untreated control. Each concentration dose was replicated four times with 20 larvae each. Mortality of the experimental group was not significantly different from the control group for each insecticide concentrations and at the various quiescent periods. These results indicate there are no significant differences in insecticide susceptibility when quiescence is 6 months or shorter. Further investigation into field mosquitoes genetic diversity, insecticide resistance profile, and environmental conditions should be considered.



Science And Policy: Improving Fish Consumption Advisory Programs in the US and Canada

Rachael King

Abstract

Fish consumption advisories are designed to communicate risks of contaminated fish consumption to consumers. Often associated with specific waterbodies, these advisories list the dangers of consuming fish of specific sizes, sex, and/or species to protect human health. Unfortunately, fish consumption advisories are ineffectively communicated, and fish tissue contaminant testing is not systematically nor comprehensively conducted. This leads not only to human health issues, but to environmental justice concerns as low-income and minority groups are most likely to use fish as a primary protein source. Methods: To identify opportunities for improving fish consumption advisories, the fish consumption advisory programs of all 50 US states and 13 Canadian provinces/territories were reviewed. Arizona and Nova Scotia were selected as case studies to reveal the deeper workings of these programs in the U.S. and Canada. The countries were compared to demonstrate how opportunities and challenges to policy correction are related in both countries. Policy is viewed as a means to improve fish consumption advisory programs because, without regional or federal requirements to monitor fish tissue for contaminants, there is no guarantee human

health and environmental justice can be protected in either country. Results: Review of fish consumption advisory programs and policies in both countries revealed large variations. In the US, states are only required to monitor fish tissue for mercury under the Clean Water Act, and all other contaminant monitoring is up to state departments. In Canada, there are no federal requirements to monitor fish tissue for any contaminants. While 49/50 states and 12/13 provinces/territories have developed monitoring programs, lack of federal oversight leads to variation in frequency of monitoring, contaminants monitored, and dissemination of fish consumption advisories across both countries. This variation results in unequal protections of human health and environmental justice. Conclusions: While the US appears to have stronger fish consumption advisory programs than Canada, neither country systematically protects human health and environmental justice. Additionally, challenges to policy correction abound in both countries, including who will move forward with environmental policy change. The countries can learn from each other's programs and policies to create stronger protections for human health and environmental justice and consult successful programs in the EU for methods to improve environmental policy.



Small Molecule Detection Using Crispr-Cas12a

Navneet Kumar

Abstract

The contamination of food and water can become threatening to health, especially for those living in the developing world. Conventional methods for molecular detection of contaminants are costly, labor intensive and time consuming. Furthermore, these methods lack both sensitivity and specificity for certain biomarkers. CRISPR enzymes, widely used for gene editing, have recently been deployed for molecular detection, and the CRISPR/Cas12a enzyme in particular, has demonstrated the capacity for specific and sensitive detection of nucleic acids. CRISPR/Cas12a enzyme, however, has not been widely used for the identification of other types of molecular species, such as those causing food and water contamination. This study focuses on designing a small molecule diagnostic using the CRISPR/Cas12a enzyme. This is done by combining strand displacement mechanisms with transcription factor proteins. When the protein binds directly to its binding site, strand displacement will be inhibited. However, if a small molecule specific to the transcription factor is bound, the protein itself will detach from the strand and allow both strand displacement and CRISPR activation to occur. CRISPR activation is associated with the splitting of an attached fluorescent probe, (also known as collateral DNA cleavage), the average emitted fluorescence of which is measured via spectroscopy. For quicker and low-cost detection, collateral DNA cleavage can also be measured on a paper-based lateral flow assay. These methods, therefore, can be used to indicate the presence of small molecules in the sample. To date, we have successfully detected the small molecules isopropyl ?-D-1-thiogalactopyranoside (IPTG) and anhydrotetracycline (aTc) using this strategy. In future studies, this design can be modified for rapid detection of toxic metals such as arsenic and

modified for rapid detection of toxic metals such as arsenic and lead, as well as anti-fungal metabolites in food and water. An efficacious small molecule detector such as this may help alleviate the uncertainty following health concerns of contaminated food and water consumption. In addition, the simple design can be further adapted for easy and convenient use at home.



Effectiveness Of Foredune Restoration In High-Energy Coastal

Abstract

Coastal dune areas are complex areas where wind, wave, and biotic processes intersect. Foredunes are shore-parallel features that protect infrastructure and habitats against flooding and erosion. During storm events, overwash can occur where waves run up and over foredunes, destroying them. High wind and wave activity at Eel River Estuary Preserve (EREP) in California makes it prone to overwash events. A 2004 overwash event, for example, destroyed a section of foredune

Environments

Michael Marvin

Finalist: Environment And Ecology: Undergraduate Second Place at EREP. In order to help protect the fragile ecosystems in the preserve, the foredune was rebuilt manually in 2018. Here, the effectiveness of the rebuilt foredune was quantitatively assessed through on-site observations and total water level (TWL) predictions. Methods: Four repeat surveys have been completed with an uncrewed aerial system (UAS) at EREP. Photos from each survey are used to create 3D digital surface models (DSMs) of the study site. Maps of change are created by comparing the DSMs over time. Quantitative methods were used to interpret these geomorphic change detections (GCDs) in order to evaluate the efficacy of the foredune. Successful foredunes accrete sediment. The impact of wave action can be determined by calculating a TWL. If the TWL exceeds an erosional threshold (elevation where foredune begins), it becomes eroded. Though there are several methods of calculating wave runup, a generalized equation was chosen to calculate how far waves run up a beach. Summing wave runup and tidal water levels at a location provides the TWL height. Results: Between May 2018 and September 2019 the TWL did not exceed the calculated erosional threshold of 5.5 m. A max TWL of 4.56 (+/- 0.32) m occurred in Dec. 2018 and Jan. 2019. The GCD shows that the foredune is accreting sediment over time: between Oct. 2018 and May 2019, the foredune accreted 0.01 m3/m2 and between May 2019 and Sept. 2019 0.11 m2/m3 accreted. Net increases on the landward slope of the dune show that natural sediment transport processes are occurring. Even though the dune is accreting, the beach eroded -0.22 m3/m2 between May 2018 and Sept. 2019. Conclusions: A reconstructed foredune was monitored from May 2018 to Sept. 2019. The foredune accreted sediment and the TWL did not exceed 5.5 m during this timespan. However, this trend will not likely continue. The TWL from storms during the winter of 2019, after our most recent survey, will have likely topped 5.5 m. Further surveys will need to be conducted to determine whether or not the accretional trend presented here will continue.



Cultural Health Navigator Strategies to Guide Refugee Patients Through Covid-19

Kenna Mcrae

Finalist: Social Sciences: Undergraduate First Place

Abstract

The COVID-19 pandemic has exacerbated health disparities in minority communities, although broad trends may obfuscate challenges faced by specific groups such as refugees. Community health programs improve health outcomes and increase healthcare quality and accessibility among marginalized communities. However, there is a knowledge-practice gap in how to leverage existing community-based strategies amid unprecedented emergencies like the COVID-19 pandemic, particularly for resettled refugee populations. Thus, our study sought to understand (1) strategies Cultural Health Navigators (CHNs) use to prevent and mitigate COVID-19 within refugee communities, and (2) how the pandemic and CHNs' changing role has affected CHNs' own well-being. Serial, semi-structured interviews were conducted with ten CHNs who serve refugee communities in the fifth largest U.S. city about their experience providing healthcare and communicating COVID-19-related information during the pandemic. Interviews were conducted by video or phone, recorded, and transcribed. We used a thematic analysis approach to code transcripts guided by the six dimensions of wellness framework. Preliminary results (Obj. 1) found that CHN roles during the pandemic have shifted away from intimate face-to-face patient interactions and programmatic outreach towards new methods of conveying accessible, culturally relevant information and combatting COVID-19 misinformation. This occurred formally and informally through conversations with patients, translated videos about COVID-19, social media outreach, and one-on-one counseling in response to patient concerns. CHNs noted community members sought to continue learning to prevent the spread of COVID-19; however, significant structural challenges remain. Furthermore (Obj. 2), CHNs appreciated the safety of modified healthcare delivery during COVID-19 such as telemedicine appointments and screening protocols but it was difficult to limit the face-to-face patient interactions that are integral to their approach. CHNs' professional roles during the pandemic have led to exhaustion, stress, and concern for their own physical,

mental, social, and professional wellbeing as well as for that of their patients. Collectively, these preliminary results suggest that during emergencies like the COVID-19 pandemic, community-based health programs are ready and critical resources with potential to limit marginalization of vulnerable communities. However, further effort is needed to support the well-being of these frontline health workers who are part of the communities they serve.



Optimization of Distribution Center's Locations

Casey Mcmahon

Abstract

There does not appear to be a singular variable that determines where companies choose to place their distribution centers, however there are several underlying factors that may alter companies' decisions on what countries they develop in. There are many reasons companies choose a distribution centers' location: infrastructure, trade barriers, and costs are often considered. Countries can alter aspects to increase the number of businesses that do business within their bounds. When a distribution center is constructed local communities benefit from corporate initiatives and funding as well as jobs and access to cheaper products. Countries often utilize taxes and regulation to positively impact the environment when introducing distribution centers to their economy. The goal is to apply weights to different factors that shape where distribution centers are located and inform decision makers on the aspects, they should alter to get the greatest return on investment. The resulting data will display which countries successfully utilize methods and pinpoint areas that have natural attraction without incentives. Several books, articles, and case studies will be examined to compile a final answer to the questions: 1) When determining the best location for distribution centers, what factors have the largest impact on business decisions? 2) What role do governments play on developing space for companies to conduct business in (how do they choose their infrastructure and customs methods and how that choice impacts trade)? 3) How can governments and the community limit outsourcing and/or bring businesses (and thus distribution centers) closer

to home? Based on these questions, I anticipate that there will be two major factors that contribute to companies' choices of location (cost and technology available). If the assumed indicators do lead to an increased number of distribution centers governments will know what incentives are most likely to incentivize companies based on their current economy and landscape.



Uncovering Validity Issues With The Mate Using Student Voices

Taya Misheva

Abstract

Researchers have argued that several items on the Measure of Acceptance of the Theory of Evolution (MATE) conflate acceptance of evolution with other constructs such as understanding of evolution, understanding of the nature of science (NOS), and understanding of the scientific consensus on evolution. This could lead to inaccurate measurement of students' evolution acceptance and may explain over 20 years of contradictory results regarding the relationship between acceptance and understanding of evolution. Yet the potential role of these other constructs in the MATE has never before been directly tested. With this study, we examined whether students answer items on the MATE based on their understanding of evolution, NOS, and the scientific consensus on evolution rather than on the basis of their personal acceptance or rejection of evolution. To do so, we conducted one-on-one think aloud interviews with 62 undergraduate students at our institution. During the interview, the student was asked to complete the MATE survey out loud, and in the process explain why they selected the answer choices that they did. We sought to include students with varying levels of exposure to college-level evolution instruction by recruiting from upper- and lower-division Biology courses, as well as non-STEM courses. We also sought to acquire diverse perspectives by recruiting students with a variety of religious affiliations and different levels of evolution acceptance. After conducting the interviews, we qualitatively analyzed the interview recordings using a constant comparison method. We found that students' scores on the MATE items were often

incongruent with their actual acceptance of evolution. For instance, most students used their understanding of the scientific consensus on evolution to answer items about scientists' views: some even pointed out how their own views do not align with their item responses. Furthermore, the interviews revealed that many item responses were influenced by NOS misconceptions, even when students expressed full acceptance of evolution within their item-level explanations. Understanding of evolution was also a major theme; students commonly acknowledged that they were unfamiliar with the evidence for evolution and did not know the age of the earth. Finally, one unexpected finding was that students frequently struggled to answer certain items due to ambiguous item wording. Given these findings, we recommend that researchers who seek to measure acceptance of evolution think critically about using the MATE survey in its published form.



The Contaminants in Philippine Fish and Their Effects on Individual and Public Health

Eryka Molino

Abstract

The Philippines' lower socioeconomic status and rapid urbanization exacerbate the impact of environmental crisis. The Philippines is the third most polluted country in the world, and it relies on a vast biodiversity of fish for food. This research project discovered the pollutants in the local fish throughout the country and then evaluated the associated health risk of eating the fish based on the national average consumption levels. Methods: 120 fish were studied total. 30 fish were extracted from each of the following sites: Dumaguete, Ayungun, Manjyod, and Bias. A fish extraction method was performed on each fish to identify several classes of pollutants. First, the fish was dissected, and 5 grams of meat were measured. Sodium sulfate and p-Terphenyl were added to the sample and then grinded into a powder. Hexane and acetone were added to the powder then placed into a jar. The jar was set in a rotisserie for 48 hours. Afterwards, the sample was run through a large column with sodium sulfate, silica gel, and glass wool. The sample was blown down and run through acidified silica gel, biobeads, and florasil sequentially in small clean up columns. It

was blown down again and placed in GC vials for testing. Results: There were more total fish from Manjyod that showed nonzero concentrations of the different pollutants. However, fish from the Dumaguete site had the highest levels of contaminants overall by a factor of more than 1000 compared to the fish from remaining sites. These contaminants included the largest concentration of polychlorinated biphenyls (PCBs), pesticides, and polycyclic aromatic hydrocarbons (PAHs) by a factor of more than 1000 compared to the remaining sites. Dumaguete also had the highest maximum phthalate concentration found. The average body weight of Filipino adult men, adult women, and children was compared to the national average consumption level of fish. This statistic was then used to calculate each group's respective risk. Conclusion: The Environmental Protection Agency's guide for fish contaminants pinpoints several health risks associated with the ingestion of these contaminants. The people who eat the fish at or above the national average consumption level may experience negative health outcomes, such as cancer and/or adverse effects on several body systems. Due to the high concentration of pollutants in Dumaguete, people who eat local fish from this site are at higher risk than the citizens who eat the fish from other sites. Future implications include informing policies on water quality treatment in Dumaguete.



Call On Me!: Science Undergraduates' Perceptions of

Abstract

A common way to engage students in college courses is to encourage them to ask questions in front of the whole class, yet few studies have explored student perceptions of participating in front of the whole class in large-enrollment college science courses. We conducted a two-part study to explore student perceptions of asking questions in front of the whole class in the context of large-enrollment classes. First, we conducted semi-structured interviews with 50 undergraduate students who had experienced being in large-enrollment science courses (which we defined as more than 50 students) at an R1 institution. Interviews were transcribed and two raters

Voluntarily Asking Questions

Erika Nadile

Finalist: Social Sciences: Graduate Student First Place identified themes in the interviews using constant comparison methods. We conducted the next part of the study as part of a semester long course-based undergraduate research experience (CURE) in which students enrolled in the course collectively worked on this research project. Using the themes that we identified from the interviews, the students in the CURE developed a closed and open-ended survey that probed student perceptions of asking questions in front of the whole class. We surveyed 417 students at a R1 institution to understand (1) to what extent students perceive other students asking questions is helpful and why, (2) how frequently students report asking questions in large-enrollment science courses and what factors discourage them from asking questions and (3) whether demographics predict student experiences related to asking guestions in class. Over 90% of students reported that they felt that it was helpful when other students asked the instructor questions in front of their large-enrollment science course. However, 47.7% of students reported never asking questions in their large-enrollment science courses, and women were 2.4x more likely than men to report never asking a guestion. The most frequently selected factor discouraging students from asking questions to the instructor in front of large-enrollment science courses is that students feel anxious when they ask questions (67.1%). Our findings highlight that although students rarely report asking questions because they are anxious and uncomfortable, they do perceive that they benefit from hearing other students participate in class. However, these inequities in comfort and reported participation may need to be attended to if student participation helps improve student engagement.



Effects Of A Variable Herbivorous Diet On Uric Acid And Carotenoids In House Finches

Danielle Pais

Abstract

Links between nutrition and health are widely studied in humans, but we have a poor understanding of the relationships between variable diet type and health state in wild animal populations. To address this gap, we studied house finches (Haemorhous mexicanus) - a popular avian model for studying sexual selection and nutrition - in captivity to examine the effects of variable seed and fruit diets on the circulation of antioxidants (carotenoids and uric acid). Dietary carotenoids play a multifaceted role as antioxidants in both human nutrition and as colorants for avian species, while uric acid works as an endogenous antioxidant. We expected the consumption of a fruit-rich diet to elevate levels. Using high-performance liquid chromatography and preliminary plasma uric acid testing, we found that dietary xanthophylls (lutein and zeaxanthin) were elevated when finches were fed a safflower-seed diet compared to sunflower seeds, whereas pilot results suggest that diet type has no effect on uric acid circulation. So far, these findings do not support our hypothesis that fruit consumption elevates antioxidant status in an herbivorous bird species and instead that differences in types of seeds consumed (at least for carotenoids) drives variation in antioxidant circulation.



Mental Health Applications: Potential to Help College Students

Bidur Pantha

Abstract

In recent years, college students in the age range of 18-31 years, show a significantly greater stress level than any other age range. However, the prevalence of mental health applications (apps for a smart phone) makes it possible for many students to get help online for their anxiety and stress. The World Health Organization recognizes the importance of this technology in their mental health action plan for 2013-2020, in which they encourage self-care via mental health apps. A common theme that is found in these apps are "healing" or calm piano music. Various studies have shown the use of music is effective to alter stress and anxiety levels in different settings. In surgery, for example, sedative music showed reduction of anxiety and stress in both the doctors and patients. Colleges have recently invested significant resources in "wellness" programs, and it is worth further investigating college students' responses to mental health apps. My research aims to determine the effectiveness of meditation and sleep applications on the reduction of anxiety and stress levels in college students with a focus on healing piano music. The main questions addressed are: To what extent can these apps provide a way for college students to get assistance for their mental health? How specifically does healing piano music reduce anxiety and stress? What are the results of the survey on how music therapy impacts college students based on their academic year in school? To further research the correlation between piano music and stress/anxiety, my research utilizes a survey taken by college students to measure their stress and anxiety levels before, during, and after musical intervention. I first hypothesize that seniors and freshman will have the greatest levels of anxiety and stress. I predict this because freshmen are new to the college environment while seniors are graduating. My second hypothesis is that college students will benefit from mental health apps and utilize them more if provided by their university. Healing piano music along with other aspects of mental health apps can potentially help college students feel calmer before exams, job interviews, falling asleep, etc. Because of the decreased nerves, it may allow for college students to perform overall better in various scenarios including the ones listed above. The results of this study will be useful to young adults and student service administrators at colleges across the country who are investing in programs and practices to help ease students' anxieties and promote their successes.



Proteomics: The New Beginning to Discovering a Drug Treatment for Schizophrenia

Rozabel Peterson

Abstract

Though schizophrenia was categorized as a mental illness over 100 years ago, there is a plethora of knowledge that continues to perplex the scientific and medical community alike. This tragic mental disorder affects approximately 1% of the general population, and many of these individuals are left with lingering symptoms, even with medication. Each schizophrenic patient has a different set of symptoms, so all of these patients experience a variety of positive and negative symptoms. Negative symptoms are called so as they are in absence, and some examples include apathy, anhedonia, lack of motivation, reduced social drive, and reduced cognitive functioning. Positive behavior, on the other hand, is a change in behavior or thoughts such as visual or auditory hallucinations, delusions, confused thoughts, disorganized speech, and trouble concentrating. Because schizophrenics do not share the exact same set of symptoms, research in schizophrenia requires a tremendous amount of medical resources. Over the last few years, new studies have started in the field of schizophrenia involving proteomics, or the study of proteins and their function. For this reason, a variety of studies were compiled in order to illustrate the potential methods by which schizophrenics can be treated using proteomic methods so that patients may have more control over their lives beyond this illness. This new frontier gives doctors and scientists alike a new opportunity to improve the quality of life of schizophrenia patients by providing a potential method through which patients would receive individualized treatment based on their specific symptoms.



Abstract

Hundreds of thousands of people die annually from malaria; a protozoan of the genus Plasmodium is responsible for this mortality. A number of antimalarial drugs are in use in order to curb this mortality, but the ubiquity of some of these therapies has caused an evolutionary pressure resulting in the development of drug resistance in the Plasmodium parasite.

Resistance Alleles And Parasite Survival (Raps)

Keeley Phillips

Parasites carrying these resistance alleles have been shown to suffer from fitness costs in some life stages, especially within the human host. For example, in the absence of antimalarial drugs, these resistant parasites produce fewer ring-stage parasites than non-resistant parasites. The goal of this study is to investigate whether a similar cost is also present during the parasite's time inside the mosquito vector. The Plasmodium parasite also undergoes several life stages within the mosquito vector, including a transition which requires passage across the lumen of the mosquito midgut. It has been observed that in approximately 15% of parasites that develop ookinetes in the mosquito abdomen, sporozoites never develop in the salivary glands, indicating that passage across the midgut lumen is a significant barrier in parasite development. I aim to investigate a possible correlation between passage through the midgut lumen and drug-resistance trends in Plasmodium falciparum parasites. This study contains a total of 686 Anopheles mosquitoes: 197 Anopheles gambiae and 489 Anopheles funestus samples collected in high malaria transmission areas of Mozambigue between March and June of 2016. Sanger sequencing will be used to determine the prevalence of known resistance alleles for anti-malarial drugs: chloroguine resistance transporter (pfcrt), multidrug resistance (pfmdr1) gene, dihydropteroate synthase (pfdhps) and dihydrofolate reductase (pfdhfr). I will compare prevalence of resistance between abdomen and head/thorax in order to determine whether drug resistant parasites are disproportionately hindered during their passage through the midgut lumen. The results of this study will illuminate a possible cost of resistance in Plasmodium falciparum parasites during its mosquito life stages, which may open the door for new methods of targeting resistant parasites within the mosquito vector.



Assessing Decision Aids For Contraceptive Selection

Molly Redman

Abstract

Selecting a contraceptive method that best fits an individual is vital to maintaining health and preventing unintended pregnancy. The lack of knowledge and awareness of highly efficient methods such as the Implant and the Intrauterine Device (IUD) varieties results in low adoption rates, especially in young women. The objective of this research is to evaluate two prominent decision aids from Planned Parenthood and Bedsider for accuracy and usability when assisting in contraceptive method selection. The findings from this study will help us to create a more effective and user-friendly decision aid tailored to the subpopulation of college women. For this purpose, we reviewed the literature to retrieve the information and guidelines relevant to birth control usage and usability heuristics. Based on this review, we performed a usability walkthrough for both tools. We also developed test cases that enumerated the combination of multiple decision factors within the Planned Parenthood guiz. We have found that the Bedsider tool adheres to the principle of accessibility, as information is presented using clear language that is understandable by a lay person. However, the user may experience cognitive overload as all methods and all decision factors are laid out in one table. While the tool does allow for small scale comparison between contraceptive methods, there is limited user control as it lacks the ability to filter decision factors. The Planned Parenthood tool provides strong user control by using input to generate customized recommendations. Among a total of 200 cases executed on this tool, 174 (87%) follows the guideline of recommending at least one long acting reversible contraceptive method to women. However, this tool does not provide visual presentation or consistency of decisions because its recommendations do not always reflect user preferences. Specifically, for 177 test cases with a strong user preference on contraceptive method or delivery, 108 (61.02%) did not return a recommendation that accommodates these preferences. The results suggest that there are gaps in the current tools that should be addressed to create better contraceptive recommendations for the user. For the next phase of our

research, we will conduct a focus group interview to get further feedback on the identified gaps and other user needs/preferences, to create a contraceptive decision aid that provides both effective and user-friendly support for college women.



Vitamin D Impacts Nrf-2 And Antioxidation Pathways That Modulate Cellular Aging

Zhela L Sabir

Finalist: Biochemistry And Molecular Biology: Undergraduate Third Place

Abstract

Vitamin D is an essential nutrient, commonly acquired via dietary intake and/or from endogenous cutaneous synthesis in response to ultraviolet radiation. It also plays a key role in preventing oxidative damage, potentially delaying the aging process, and as an anti-carcinogenic agent. The biologically active form of vitamin D, 1,25-dihydroxyvitamin D (1,25D), binds to the vitamin D receptor (VDR) and promotes formation of an active complex with the retinoid X receptor (RXR) called VDR-RXR. This VDR-RXR heterodimer controls vitamin D-regulated genes in such target tissues as kidney and colon, modulates immune defenses, and controls cellular proliferation. The activation or presence of antioxidants eliminates reactive oxygen species (ROS) and can therefore prevent cellular damage stimulated by ROS. Target genes encoding antioxidant enzymes contain antioxidant-responsive elements (AREs) which act as binding sites for transcriptional regulators such as nuclear factor (erythroid-derived 2)-like 2 (Nrf-2). This study aims to investigate the influence of vitamin D-VDR signaling on Nrf-2 activity. ARE-luciferase reporter plasmids were used to measure Nrf-2 activity in human kidney cells in the presence of 1,25D/VDR. Results indicate that VDR does not directly interact with the ARE on target genes. Instead, cells transfected with both Nrf-2 and VDR modulated Nrf-2 activity in a 1,25D- and VDR-dependent manner; with low 1,25D increasing Nrf-2 activity while higher concentrations inhibited Nrf-2. When treating cells with 1,25D and/or urolithin-A, a nutraceutical hypothesized to cooperate with vitamin D, Nrf-2 activity was instead consistently upregulated. Moreover, gPCR studies with Nrf-2 target genes GCLC and HMOX1 revealed similar data consistent with the luciferase-based assays.

Collectively, these results imply that VDR likely targets Nrf-2 genes indirectly either by influencing the activity of Nrf-2 transfactors and/or by post-translational modification of Nrf-2 to either activate or suppress Nrf-2-directed gene regulation. The modulation of Nrf-2 activity by a VDR-mediated pathway suggests a possible regulatory role for vitamin D in anti-oxidation and cellular aging.



The Impact of Menstrual Education on the Treatment of Gynecological Conditions

Emily Santora

Finalist: Social Sciences: Graduate Student Third Place

Abstract

In the US, menstrual education has historically been heavily stigmatized and lacking biologically accurate information. A lack of quality menstrual education during preadolescence may contribute to obstacles that women face in reproductive health care. Further research is needed to understand how girls' menstrual education experiences impact the ways in which they understand and seek treatment for common gynecological conditions. Methods: A mixed methods approach allowed examination of the effects of menstrual education on ability to recognize and seek treatment for gynecological conditions. First, a literature review revealed the historical and social context surrounding menstrual education in the US. To identify current challenges and gaps in knowledge related to menstruation, I conducted focus groups with college-aged women. Finally, semi-structured one-on-one interviewers with women diagnosed with endometriosis and polycystic ovary syndrome allowed better examination of the relationship between menstrual education and reproductive health outcomes. Developing a codebook with definitions and exemplars of significant text segments and applying it to the data revealed themes. Results: The most common themes included sources and quality of information, stigmatization of menstruation, preparedness to manage menstruation, and ability to identify abnormal menstruation. Women often receive information about menstruation from their mothers, friends, teachers, as well as the Internet and social media. However, those sources of information sometimes perpetuate stigmatized ideas of menstruation and misinformation, contributing to

negative attitudes and feelings of shame and fear about menstruation. That poor quality of information was instrumental in the ability to identify symptoms of abnormal menstruation, as women have little knowledge of what is considered normal versus abnormal menstruation. Thus, women expressed a desire to know more about their own reproductive health, including ovulation, fertility, and birth control options. Conclusions: Poor menstrual education experiences leave women ill-equipped to identify and seek treatment for gynecological conditions. Those findings may have implications for the trajectory of treatments for endometriosis and polycystic ovary syndrome, contributing to a decreased quality of life and potentially impacting future female reproductive potential. Future research may further explore the implications of a lack of access to technologies and therapies that health care providers use to treat menstrual disorders.



An Analysis of Nuclear Transport Proteins Ipo4, Camk4, and Ntf2 in Alzheimer's

Missy Tran

Abstract

Previous research has suggested a strong correlation between Alzheimer's Disease (AD) and malfunction of the Nuclear Pore Complex (NPC). This brings into guestion the maintenance of other functions and processes that rely on the regulatory factors of the Nuclear Pore Complex in AD afflicted cells. Research was conducted to analyze the relevance of nuclear transport proteins and regulators in AD and how they may affect the functionality of neural tissue, specifically the proteins IPO4, CAMK4, and NTF2. Analysis of gene expression data for these proteins has suggested that there is a significant level of down regulation in these genes in AD afflicted cells compared to Non-diseased tissue. A comprehensive study was conducted to explore the localization of these proteins in neural cells and to quantify the amount of protein using immunohistochemistry and Western Blot. Mislocalization and variation in protein levels could be indicative of transport errors related to cargo. Lower levels of immunoreactivity for NTF2, an active transport regulator of RAN, suggests there is a correlation between the development of Alzheimer's and dysfunction in cell transport.

Results establish greater importance and need for studies investigating NPC transporters and regulators to gain a holistic understanding of AD at a cellular level. Future plans for study are focused on immunoprecipitation and nuclear cytoplasmic prep to verify binding and localization of proteins. Functional validation of proteins could be conducted through knockouts in cell culture or analysis of the interactions of these proteins with their cargo or tau.



Why Does Russia Have a Higher Abortion Rate Than Other Post-Soviet Countries?

Dina Ziganshina

Finalist: Science In Society: Graduate Student First Place

Abstract

Induced abortion is controversial internationally, which makes it an ever-relevant research topic. In 1920, USSR was the first country to legalize abortion upon request. When USSR dissolved in 1991, the political ecosystem of all 15 post-Soviet countries led to similar abortion laws, allowing abortion on request until 12 weeks and in special circumstances until 22 weeks. However, abortion rates vary greatly across these countries with Russia consistently the highest, according to United Nations. Why, when the abortion laws are so similar? Methods: I compared UN population-level fertility indicators in 15 post-Soviet countries between 1991 and 2018 to understand the systemic differences as they relate to abortion and form questions and hypotheses for future research. The main indicators in this preliminary study were total and age specific abortion and fertility rates, unmet need for contraception, and types of contraception used. Results: I found few systemic differences that explain the prevalence of high abortion rate in Russia compared to other post-Soviet countries. Russia had similar or higher rate of contraceptive use (any method). However, the most popular form of contraception in Russia is the male condom, which is less reliable than other modern methods. Additionally, Russia had the highest rate of relying on the rhythm method among all post-Soviet countries. Predictably, Russia has some of the lowest fertility rates and the highest abortion rates for each age group. Conclusion: Use of less reliable contraceptive methods cannot be the only reason for the h igh abortion rate in Russia,

so what are the other factors? The next research step is the systematic review of interview and survey studies on abortion reasoning in Russia. After that, I will combine all findings in an agent-based model to test my current hypothesis that many factors, including high price of contraception in presence of free abortion, lack of standardized sex education, and intimate partner violence are the leading interacting causes of high abortion rate in Russia. Figuring out why Russia has the highest abortion rate among all post-Soviet countries in the presence of very similar abortion laws is important, since it shows that legality of abortion may not be the leading cause of frequent abortions in a population. Comparing Russia to other post-Soviet countries is a perfect case study for learning what the leading causes of high abortion rates are.