

Minimizing Health Disparities (MHD)

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The Effects of High Fructose Corn Syrup on Diabetes Mellitus

ABSTRACT: Diabetes is one of the most common diseases in the United States. Many people that suffer from diabetes are likely to die from diabetic-related complications. A possible cause to the increase of diabetes is the limitless accessibility to sugar. Many studies support the claim that high fructose corn syrup (HFCS) is the cause to the increased number of deaths from diabetes. In this study, data from other literature was used to compare and analyze experiments that involve HFCS and other sugars for evidence to the claim that HFCS has properties that promotes the metabolic dysregulation of diabetes to occur. Although, there is plenty of evidence that the overconsumption of sugar is detrimental, further research is needed to understand what is specifically promoting this metabolic dysregulation of diabetes.

Gabriela Franca

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Reinstatement Cues of Cocaine-seeking Behavior-Extended Literature Review

ABSTRACT: The topic of drugs and addiction in the brain strongly correlates to the area of study of Neuroscience and Cognitive Science and is discussed in this paper. An extended literature review of the article, “Dynamic CRMP2 (collapsin response mediator protein 2) Regulation of CaV2.2 (voltage-gated calcium channel type 2.2) in the Prefrontal Cortex Contributes to the Reinstatement of Cocaine Seeking” written by Buchta et al. (2019) is utilized to understand the relationship between cocaine relapse and common binding partners of the drug when in use. The issue of drug addiction and relapse is at an astoundingly high rate of 40-60% of people affected by it compared to 50-70% of people affected by chronic illnesses such as asthma and hypertension (National Institute of Drug Abuse, 2020). A literature review about understanding the cause for cocaine addiction relapse, how it affects the brain, and studying past and current treatments and therapies for it is conducted. Methods utilized by Buchta et al. (2019) include self-administration and extinction testing on lab rats, implanting catheters for intravenous cocaine infusions and so on, whereas the methods I conduct include analyzing their work and researching similarly related articles for better understanding. Findings include that their work about how combining CRMP2 and CaV2.2 influences increased drug-seeking behavior in rats introduces the possibility of pharmacotherapies that can be created to reduce their binding behaviors and, in turn reduce, cocaine-seeking response. In conclusion, this article was helpful in my research and interest in drug addiction and future pharmacotherapies as treatment.

Ana Hernandez

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An in-depth review of treatment options for COVID-19 infections

ABSTRACT: The effects of the global pandemic caused by the virus severe acute respiratory syndrome coronavirus 2 (SARS-CoV2) has scientists racing to find the most effective therapy option while earnestly waiting for a widely available vaccine. This article will review the most popular therapy options starting with hydroxychloroquine, chloroquine, remdesivir and convalescent plasma to explore why they are/were being considered in the treatment for COVID-19 as well as some of the limitations of the trials that have been reported in various journals. We will briefly go over why drugs such as remdesivir would be difficult in combating the novel coronavirus in the most affected communities; that is black, indigenous and latinx communities. It is important to note that topics involving treatment options for COVID-19 patients and for the potential post-exposure prophylaxis (PEP) effects they could provide healthcare workers will likely be updated as more research from new trials and studies arises.

Dominique Milligan

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Mentor: Dr. Imran Patel – Department of Medicine



Oral Appliance Therapy in the Comorbidity of Hypertension in Obstructive Sleep Apnea Syndrome

ABSTRACT: Obstructive sleep apnea (OSA) is a prevalent sleep-related breathing disorder that has the potential to lead to the development of hypertension. Obstructive sleep apnea causes a complete obstruction in the upper airway which results in apnea; apnea is defined as an airflow obstruction. Hypertension, known as high blood pressure, is an excessive force exerted on one's blood vessels by circulating blood. Oral appliances, which are provided and fitted by dentists who specialize in dental sleep medicine, are completely non-invasive. They are primarily used to treat mild to moderate obstructive sleep apnea and its comorbidities. According to the 12 articles that have been analyzed, it has been concluded that oral appliances can effectively cause a substantial reduction in blood pressure in patients who have both hypertension and obstructive sleep apnea in as little as 24 hours. A mixed-methods systematic review has been used to carry out the results from these publications.

Shaira Perez

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Mentor: Dr. Ravi Goyal – Animal and Comparative

Biomedical Sciences



Mechanistic and Functional Analysis of Ultraconserved Long Intergenic Non-Coding RNA 00867

ABSTRACT: Ultraconserved Elements (UCES) are characterized by the ability to retain perfect sequence identity across human, mouse, and rat genomes. Most UCES are long noncoding RNAs (lncRNAs) (Fiorenzano et al., 2018). In recent years, lncRNAs have been recognized as potentially novel and important components of biological regulation. The focus of this study is the ultraconserved long intergenic noncoding RNA 00867(linc00867) which is predicted to be upregulated by hypoxia. In this study, a literature review on lncRNAs spanning from the molecular characteristics to functions and regulation is presented. Next, there is a section on the methods that we will utilize to test the hypothesis that linc00867 regulates human and mice brain microendothelial cells under hypoxic stress. We plan to investigate the role of linc00867 in cell survival, proliferation, and migration, under hypoxic stress in human and mice brain microendothelial cells (BMCs). Furthermore, we will examine human and mouse BMC differentiation into capillary tube-like structures (angiogenesis). We will utilize the Cre-lox system to knockout linc00867 in human and mouse BMCs and we will create a hypoxia chamber with 2% oxygen to induce hypoxic stress. We will compare human and mouse linc00867 knockout BMCs to wildtype BMCs in all experiments. Bioinformatic tools will be used to further examine upstream and downstream biological pathways controlled by linc00867. This study will show the mechanism and function of linc00867 in human and mouse BMCs under hypoxic stress. The results of this study will provide insight into therapeutic applications for cerebrovascular diseases that result from pathological angiogenesis.

Bassil Ramadan

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Examining Retinal Prostheses:

Consideration of Points of Intervention, Battery, Materials, and Systems

ABSTRACT: Retinal prostheses provide an exciting opportunity to explore medical techniques and treatments in order to give vision back to those who suffer from retinopathy. Loss of vision affects millions of individuals every year. This paper explores the challenges in the development of retinal stimulation and materials and design of implantable devices— with a special focus on pathways of retinal stimulation and materials and design of implantable devices. Special consideration will be made toward the power sources and wiring in these devices, along with a brief summary of the existing retinal prosthesis devices. The paper primarily explores existing literature in order to elucidate the gaps between neuroscience and engineering and highlight future areas of research. Ultimately, the paper argues that while devices such as the ARGUS II provide an exciting opportunity for individuals with retinopathy to regain some sense of vision, there remain many barriers and uncertainties as to how to engage medical devices within the retina. This paper aims to understand how engineers can create better retinal prosthesis devices which integrate more effectively and last longer.

Victorino Rodriguez

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Biochemistry

Mentor: Dr. Kirsten Limesand – Nutritional Sciences



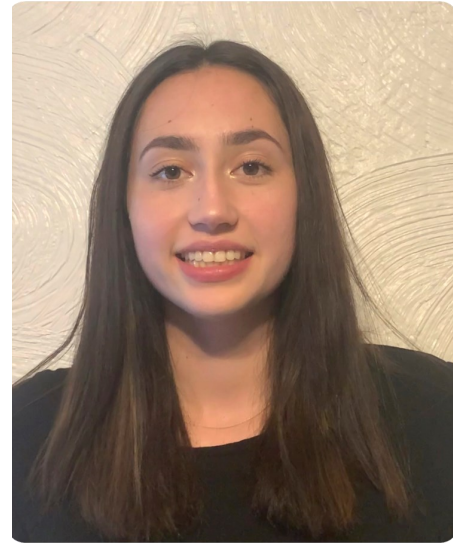
Function Evaluation for Mitochondrial Dysfunction and Involvement in Wound Healing

ABSTRACT: Mitochondrial dysfunction is the result of defects in mitochondria structure or inadequate substrate concentrations and is linked to multiple diseases depending on the types of cells that are being affected. Because of this wide involvement in diseases and disorders, mitochondrial dysfunction could be having an effect on the process of wound healing. This literature review will look at techniques to evaluate mitochondrial function and mitochondrial involvement in the wound healing process. Mitochondrial function can be evaluated by measuring activity of enzymes involved in their energy producing reactions, and oxygen consumption using spectrophotometry and polarimetry. Wound healing requires ATP and reactive oxygen species produced by the mitochondria in order to undergo its steps of hemostasis, inflammation, proliferation, and remodeling.

Katerina Sacoman

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Long Range Signaling Systems in *Arabidopsis Thaliana*

ABSTRACT: Long-range signaling systems are extremely complex and prevalent within plant growth and development. One signaling system in specific leads to extra root growth within roots in areas with high nutrients, and less root growth in areas with less nutrients for growth to be more efficient and not waste energy. This is because the roots in areas with less nutrients can send a signal to the shoot, and the shoot regulates new root growth in areas of soil with the most nutrients. The XIP1 receptor regulates this long-range signaling mechanism. The BLH6 gene binds to the promoter region of the XIP1 receptor, and overexpression of BLH6 leads to smaller plant organs. Looking at the expression of XIP1 in *blh6* mutants, allows for testing if BLH6 regulates XIP1. This will allow the determination if BLH6 represses XIP1 expression in the phloem, or if it represses XIP1 in other cell types that it is not normally expressed in. It is also possible that BLH6 acts as an activator, which predicts XIP1 expression would be reduced in *blh6* mutants. Strains homozygous for the mutations in BLH6 and for the XIP1: promoter reporter gene will be created, so that these models can be distinguished. This research is being done on the plant *Arabidopsis thaliana*, as this species matures and reproduces quickly and is part of the cabbage family. So far, more research needs to be done, but the leading hypothesis is that *blh6* represses XIP1.

Ycied Talavera

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Diminishing Racial Bias in Medical Education Through the Teaching of Cultural Awareness

ABSTRACT: Literature supporting the prevalence of structural racism and how Black lives have been failed in the medical field have expanded since the rise of the Black Lives Matter Movement, this is causing a reassessment of our academic and healthcare delivery systems in the United States. Racial biases on Blacks is influenced by racial profiling and continues to be practiced and taught in the medical field. By looking at “culture” as its own category in medical education, my study intervenes in finding the flaws in medical school education in Arizona and whether their lesson plans are making sure to address the difference between race and understanding culture. My central research question considers what exactly can be done in order to better educate students and better stray from the racial profiling being taught in medical institutions? Through an anonymous and randomized 8 question survey, that will be asked to 25 random first year and 25 random last year medical students at the University of Arizona Tucson Campus. This will help better understand medical students' learning experiences and will assist in assessing the effectiveness of medical teaching strategies and the need for better education in cultural competency, by finding how and if first year and last year students' mindsets have evolved through the education their medical institution provides to the