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Fibroblastic reticular cells modulate tumor microenvironment of Chronic lymphocytic leukemia (CLL)

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ABSTRACT

In patients with Chronic Lymphocytic Leukemia (CLL), there is an overgrowth of leukemic B-lymphocytes. This proliferation of B-cells requires inputs from the external microenvironment, which provides soluble molecules as well as physical interaction necessary for survival and proliferation. Studies have shown that the lymph nodes are one of such microenvironments. However, the specific interaction between lymph nodes and leukemic B-cell has not been elucidated. This study examines how fibroblastic reticular cells (FRCs) from the lymph nodes, and IL4 secreted by T-cells affect the proliferation and signaling of leukemic B cells.

When leukemic B cells were co-cultured with FRCs, there was a significant increase in the number of leukemic B cells. Moreover, the expression of CLECL1 surface protein is further increased on B-cells. Using recombinant CLECL1 protein, it was demonstrated that IL4 cytokine production increases in both naive T-cells and Th2 cells. In the presence of IL4, the level of proliferation of CLL B-cells is amplified. IL4 can also increase the expression of lymphotoxin (a cytokine) in B-cells and the lymphotoxin receptor on FRC. The expression of lymphotoxin is repressed in the presence of FRC. The expression of lymphotoxin in B-cells correlates with high levels of the adipocytokine CXCL13 by FRC. High level of CXCL13 subsequently correlates with reduced expression of CXCR5, which is required for B-cell migration and localization to the FRCs and is believed to play an important role in CLL cell proliferation. This study demonstrates that interactions with FRCs and IL4 is essential and necessary CLL progression.

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Developing a Solar-powered Seawater Hydroponics System Monitored by an Arduino Salinity Sensor

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ABSTRACT

To feed the growing global population, estimates suggest we will have to increase food production by as much as 68 percent by 2050 (Marr, 2022). To aid this issue, we developed a cost effective solar powered seawater based hydroponic system that uses a 15% seawater medium. To ensure little water is wasted, an Arduino powered salinity sensor was installed. This sensor and the computer that runs it were powered through solar power, which conserves energy and increases the system's mobility. Through the sensor reading the ppt (parts per thousand) of the medium, the user can adjust the levels of salinity to keep it at the original 15%. The expected range of salinity should be 6.4 - 6.5 ppt. Our system costs $413.23 which is significantly less than other systems on the market while still using a part seawater mixture and Arduino sensor to monitor the salinity levels. Popular systems like the Current Culture Under Current 4 costs $1421.06 and the Under Current XL RDWC costs $1,620.95. These systems do not utilize seawater or a sensor, yet our system costs around $1000 to $1200 less, increasing its accessibility. Using a seawater solution in sensorless systems may have detrimental effects as users would not know whether to add freshwater or seawater as water evaporates from the system and is absorbed by the plant roots. Growing plants in a hydroponic system that uses 15% seawater allows freshwater to be saved and used for drinking and other purposes.

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The Effect of Copper Sulfate on the Development and Mortality Rate of Artemia salina During and After Remediation

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ABSTRACT

As the world pushes towards net zero emissions, demand for metals and minerals has increased, prompting discussions regarding deep-sea mining to meet this need. Although there is a good understanding of the effect of copper and other metals found in sediment plumes produced by deep-sea mining on aquatic organisms, there is little research on the effect of sulfate copper exposure specifically on Artemia salina, once remediated from contaminated water. The problem being investigated is, to what extent is the development and mortality rate of Artemia salina affected by acute exposure to copper sulfate during and after remediation? This study hypothesized that if Artemia salina is exposed to copper sulfate, it would inhibit development and increase the mortality rate, even after remediation. This study was performed using three cultures of Artemia salina labeled "Control", "Short Exposure", and "Long Exposure". The long-exposure group was exposed to 12.5 μM copper sulfate throughout the study, whereas the short-exposure group was remediated halfway through the study using a specialized net. Data was collected by recording the Artemia salina development stage and mortality rate every day for one week. In summary, the hypothesis was supported. Artemia salina exposed to copper sulfate displayed conspicuous retardation in the development and a notable escalation in mortality rates during and after remediation compared to the control group.

Keywords: Artemia salina, copper sulfate, deep-sea mining, remediation, mortality rate, development stage

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Determining the Qualitative and Quantitative outcomes of LZTR1 Mutations on Wing Development and Lifespan in Drosophila melanogaster as an Indicator of Disruptions in the Ras/MAPK Pathway

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ABSTRACT

Noonan syndrome affects 1 in 1,000 to 2500 births yearly and results in short stature and congenital heart defects. Mutations in the developmental Ras/Raf/mitogen-activated protein kinase Ras/MAPK) pathway generate Noonan syndrome. Many studies have found case reports in which leucine zipper–like transcriptional regulator 1 (LZTR1) brings about Noonan syndrome. Although many scientists have examined Noonan syndrome in humans, not many of them have found the role in Drosophila (which is crucial as Drosophila is a model organism) Thus, this study examined the role LZTR1 in vein tissue, wing area, (The Ras/MAPK pathway directly influences the size of a fruit fly's wing) and lifespan of the Drosophila to model the role of LZTR1 in the Ras/MAPK pathway. MAPK Kinase (MEK) (a known inhibitor of the pathway) was used as a positive control. It was found that although the lifespan did not make any difference for each LZTR1 mutated and MEK group compared to the Wild-Type (WT) groups ($p > 0.05$), Drosophila that carried mutations for LZTR1 and MEK had significantly more vein tissue ($p < 0.001$) and significantly smaller wings ($p < 0.05$), suggesting that LZTR1 affects the pathway. Future research may include using the information found in this study to test treatments on Drosophila to alleviate some of the symptoms in Noonan syndrome.

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BRIDGING THE GAP FOR ALICE: CHARITABLE ORGANIZATIONS ACTING AMIDRISING INFLATION AND FURTHER SOLUTIONS USING ARTIFICIAL INTELLIGENCE

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ABSTRACT

Nationwide, nearly 37.9 million U.S. households fall into the Asset Limited, Income Constrained, Employed (ALICE) population which consists of households making incomes above the Federal Poverty Line (FPL) but below the financially-secure ALICE Household Survival Budget, rendering them ineligible for numerous public assistance programs due to income thresholds. To bridge this gap, nonprofit organizations such as United Way and Feeding America are providing ALICE-tailored assistance programs. Through data collected from ALICE reports and U.S. Census data, comprehensive analysis has been conducted using the U.S. Bureau of Labor Statistics Data Retrieval Tools and the Federal Reserve Bank of Atlanta's Policy Rules Database to provide insight into the complications associated with the ALICE population. Further, this study conducts extensive analysis on data extracted from the "Integrated Public Use Microdata Series - Current Population Survey (IPUMS CPS) data repository using Microsoft Excel's "Pivottable" to quantify the impact of nonprofit organizations through the Household rasch food security score (FSRASCH) metric. As a result of these methods, a large gap – in terms of ALICE households benefitted – is evident, leading to a conclusion: inadequate access to information regarding assistance programs. To address this large portion of ALICE households nationwide without assistance, AskALICE, an AI chatbot, is proposed, aiming to provide an easily-accessible, centralized, simple solution to those who lack access to information regarding these programs. By leveraging various data tables, assistance program information, and machine learning capabilities, it will accurately respond to user queries and, after evaluating specific criteria, identifies the assistance programs the user is eligible for. Further, a working prototype was built using Yellow.ai's Orchestrator LLM to serve as a proof-of-concept.This study sheds light to the millions of ALICE households nationwide left without assistance from public programs and offers practical solutions with significant possible implications to enhance economic stability.

Keywords: ALICE, nonprofit assistance, economic stability, public assistance programs, artificial intelligence, household income, data analysis

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Study of Supramolecular Antioxidant-Photosensitizer Dyads for Drug Delivery Using Quantum Chemical Descriptors:HOMO-LUMO, Dipole Moment, and Binding Energy

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ABSTRACT

The research uses Density Functional Theory to study the molecular and electronic behavior of new supramolecular dyads that link a flavonoid to C60 fullerene and allicin therapeutic agents. The research evaluates their dual functionality for photodynamic therapy and antioxidant pharmacology through electronic analysis of their operational mechanisms. The optimization of geometries shows that both dyads maintain stable molecular structures. The fullerene–flavonoid dyad achieves stability through powerful pi–pi stacking bonds, yet the allicin–flavonoid complex forms through hydrogen bonds and van der Waals forces, which produce substantial negative binding energies that prove thermodynamic stability.

We used electronic structure parameters to study the charge transfer behavior of the system. The HOMO–LUMO energy gap of the fullerene–flavonoid dyad decreased substantially from the flavonoid alone, which indicates improved electronic polarizability and reduced photoexcitation energy needs for photosensitization applications. The molecular electrostatic potential maps on the flavonoid and fullerene cage were calculated to figure out how the photoinduced electron transfer from the flavonoid to the acceptor for reactive oxygen species production works. The allicin–flavonoid dyad shows a reduced HOMO–LUMO gap with orbital distribution across the entire complex, which indicates a cooperative effect that boosts electron donation for better radical scavenging.

The allicin–flavonoid complex exhibits a higher dipole moment than the fullerene-based dyad, which indicates better solubility in biological fluids with polar characteristics. The study shows that the allicin–flavonoid dyad acts as a strong synergistic antioxidant. Also, the fullerene–flavonoid structure can be a potential photosensitizer candidate according to quantum chemical descriptor analysis for drug development.

Keywords: Allicin–flavonoid dya, DFT, HOMO-LUMO, Dipole Moment, and Binding Energy

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The effect of Caffeine on the rhizogenesis of Asparagus seeds

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ABSTRACT

Green Tea's effect on Plant Growth
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This experiment investigated caffeine's effect on asparagus root development and the absorption of minerals. Previous studies have tested different concentrations of caffeine in a nutrient medium; thus, obtaining data on caffeine's effect under optimal nutrient conditions becomes necessary. The influence of caffeine on plant yield and seed germination rates changes depending on different concentrations. To solidify the effects of different concentrations, this experiment has been conducted using concentrations of decaffeinated and caffeinated green tea. Given the prolonged germination period of asparagus seedlings, a pre-planting soaking procedure in water was done for 24 hours to enhance germination. After soaking the seedlings, they were placed in rockwool to germinate. Data was collected weekly on the root growth, and the fresh weight was collected after the experiment. By week 4, the root growth of 1% decaffeinated green tea exceeded threefold of what was observed in the control group. After week 4, all groups excluding 1% decaffeinated exhibited less root development than the control group. Concentrations of 2% or concentrations that contain caffeine restrict root growth and fresh weight. The fresh weight of seedlings that received caffeinated treatments is half that of seedlings treated with 1% decaffeinated solution. Notably, the sprouting ratio was most influenced by green tea concentrations rather than caffeine content, with 2% decaffeinated and caffeinated concentrations exhibiting the greatest sprouting ratio. With high root length and full sprouting ratio, asparagus seedlings treated with 1% decaffeinated green tea indicated the inefficiency of caffeine on improving the germination rate of asparagus seedlings.

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THE EFFECT OF ARTHROSPIRA (SPIRULINA) ON THE GROWTH OF BRASSICA OLERACEA VAR. CAPTITA

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ABSTRACT

Exploration on Mars has caught the attention of many experts, scientists, and nations across the globe. However, there are a multitude of challenges that must be addressed before sending humans to Mars. This includes huge costs within the mission and even problematic issues revolving around human health within Martian conditions. Additionally, studies have found that cultivating crops in the Martian regolith could significantly reduce the cost of the mission. However, Martian regolith isn't suitable for plants to grow in, due to its lack of organic material. Lately, Spirulina has also been used in agriculture to enhance plant growth, yield, and seed germination. However, there isn't any information on whether Spirulina can be used in Martian regolith to help promote plant growth. In this study, it was hypothesised that Spirulina can be used in Martian regolith as either a substrate or a supplement, and in the end, help promote plant growth of Brassica oleracea var. capatita (cabbage). This study was done with the MGS-1 Martian simulant, the most recent, and up-to-date simulant that resembles the closest to Martian regolith. Ultimately, only 4 seeds germinated in Part A, while 2 germinated in Part B. In Part C, all substrates showed growth of Cabbage. Overall, the hypothesis was refuted, as the cabbage seeds failed to germinate within the MGS-1 simulant with Spirulina, furthermore indicating that the simulants' characteristics which resemble Martian regolith won't be suitable for plant growth, even when adding organic matter such as Spirulina arthrospira. However, it was found in Part C that letting the seeds germinate first on paper, before planting could significantly promote plant growth in the MGS-1 Substrates.

Keywords: Exploration, Mars, Martian Regolith, Spirulina arthrospira, Plant Growth, Substrate, MGS-1, Martian Stimulant, Brassica oleracea var. Capatita, Organic Matter, Organic Material

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The Effect of Thiolated GMO consumption on the Fecundity and Longevity of *Drosophila melanogaster*

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Genetically modified organisms (GMOs) have made a significant impact on our lives today. Most food products we consume have been genetically modified to enhance certain characteristics. This may include genes inserted to produce proteins that repel insects or enhance nutrient production in the food. Recently, yeast has become the newest organism to be genetically modified. This genetically modified yeast produces thiols, compounds that replace oxygen with sulfur. Thiols are present in industrial brewing and are highly aroma active. They are highly reactive even in low concentrations, making them extremely difficult to analyze thoroughly. However, GMOs, a recently developed technique, lack sufficient long-term research on potential human impacts due to the extended human lifespan. The EU has stringent guidelines on GMOs due to insufficient knowledge about their impact on human health. It is imperative to investigate potential effects of GM foods over generations. The purpose of this research was to determine whether consuming GM yeast would have any effect on fruit flies over several generations. Fruit flies are a model organism, sharing over 60% genetic similarity to humans. They were fed different concentrations of genetically modified yeast, and their reproduction rate and longevity were observed over three generations and compared to control groups. Eggs were counted and survival rates were calculated. The Cosmic Punch yeast (100% GMO) had the highest fecundity rate overall while the British Ale Yeast (Positive Control) had a higher rate of longevity. It was concluded that while the Cosmic Punch yeast enhances reproductive rates, the British Ale Yeast promotes greater survival in fruit flies.

Keywords: GMOs, fecundity, longevity, fruit flies, thiols

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IMPACT OF FLUCTUATIONS BETWEEN MGLUR5 AND MELATONIN IN MAJOR DEPRESSIVE DISORDER (MDD)

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ABSTRACT

Major Depressive Disorder (MDD) is a debilitative illness that severely impacts quality and duration of life, with neurologists and psychologists seeking remedies to this disease. Currently, past studies have found that metabotropic glutamate receptor subtype 5 (mGluR5) and melatonin have been implicated in depressive pathways; however, there is a lack of studies investigating the relationship between mGluR5 and melatonin in MDD pathogenesis. Thus, the objective of this study was to observe fluctuations in mGluR5 and melatonin levels in MDD pathogenesis. 67 patients were recruited for this study, after being screened to identify whether they meet the inclusion/exclusion criteria. Actigraphy monitors were used to identify the baseline circadian rhythms of the patients, with the patients entering the lab for a three night stay. During these three nights, PET scans, and melatonin extractions were performed. Melatonin levels exhibited fluctuations throughout the the three nights, with the levels primarily decreasing during the sleep deprivation period. However, the majority of participants did not exhibit significant differences between one another in melatonin level phase shifts. Additionally, mGluR5 levels were not significantly different among MDD participants, when compared to their control counterparts. Due to the non-significant differences between MDD and control groups for both factors, there was no significant liink observed between mGluR5 and melatonin levels in MDD vs control participants. Thus, results suggest that there is another underlying factor impacting MDD. Future applications include studying alternative pathways of MDD pathogenesis.

Keywords: Metabotropic Glutamate Receptor Subtype 5 (MGluR5), Melatonin, Circadian Rhythms, Major Depressive Disorder (MDD)

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Bistable Structures: The design and fabrication of a large-scale hygroscopic bistable sinusoidal arch structure with applications with autonomous environmental actuation

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ABSTRACT

Bistable structures, structures with two distinct equilibrium states achieved via buckling-like deformations, are seen throughout engineering applications in shape-morphing and energy-harvesting systems. Typically actuated by mechanically induced snap-through buckling, sinusoidal arches, a unique geometry, can induce bistability when fixed or pinned. However, environmental actuation via heat and humidity has yet to be explored in the literature. While existing studies focus on designing and evaluating mechanically actuated small-scale bistable arch structures, this study focuses on designing and fabricating a large-scale bistable sinusoidal arch with structural programmability through a curling property in the compliant base, that possesses applications of environmental actuation through an effective fabrication method for structural uniformity and zero initial structural frustration. Two hygroscopic materials: balsa wood and white ash wood were explored for bending. Though only mechanical actuation was tested, the material selection suggests potential for environmental actuation, paving the way for environmentally triggered autonomous actuation. The fabrication procedure required a steaming vessel and sinusoidal mold to form the arch-like component. After testing, white ash wood proved superior due to its resistance to flexural failure. The structure was tested twice, with design adjustments made and tested via numerical and experimental simulations after the first trial revealed excessive stress concentrations in the base. A final design was proposed and demonstrated bistability, though the curling action in the base was minimal.

Keywords: Sinusoidal, Bistability, Actuation, Arch, Fabrication, Design, Large-scale, Finite Element Analysis, Structural failure, Flexural failure, Hygroscopic, Buckling, Deformation, Snap-through buckling

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Alternate Methods to Facilitate the Nucleophilic Attack of Alcohols in Fischer Esterification: The Application of Sulfonated Silica Gel as an Acid Catalyst and Zinc Oxide as a UV Photocatalyst

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ABSTRACT

Fischer esterification is one of the most prominent industrial methods of ester production, involving a reaction between an alcohol and carboxylic acid in the presence of a catalyst to turn the carboxylic acid into an ester. However, Fischer esterification results in large amounts of waste due to the reaction reaching equilibrium, leaving reactants unconsumed. To increase the yield of ester, various catalysts were tested to determine their efficiency in the reaction between ethanol and citric acid, which form a common ester compound called triethyl citrate, used as a flavoring agent. A sulfonated silica gel catalyst was included in the reaction as a method of removing water from the reaction. Additionally, zinc oxide was used as a UVC photocatalyst to facilitate the nucleophilic attack of the alcohol on the carboxylic acid as the Zn2+ and O2- ions protonate the carboxylic acid. The sulfonated silica gel catalyst was tested in various quantities all with a one-hour reaction time. As expected in the hypothesis, as the quantity of sulfonated silica gel added to the reaction increased, so did the yield of ester. The ZnO was tested in the same quantities but at varying reaction times since it is a recyclable catalyst. It was determined that increasing the reaction time also increased the yield of reaction, further supporting the hypothesis. Compared to the control H2SO4 catalyzed reaction, both the sulfonated silica gel and ZnO catalysts resulted in higher yields of ester, suggesting that the implementation of combined catalytic techniques would benefit industrial ester production.

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Comprehending Developmental Prosopagnosia Using a Trained Deep Convolutional Neural Network: A Perceptual Study

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ABSTRACT

Developmental prosopagnosia (DP), also known as face blindness, is a condition in which individuals have an impairment in the FFA region of their brain. This results in inability to recognize faces. Majority of the current body of literature focuses on the biological aspect of developmental prosopagnosia, but there is a scarcity of articles relating the condition to a perceptual standpoint. The goal of this study is to see how images depicting the visual impairments seen by people with developmental prosopagnosia affect the robustness of a convolutional neural network trained to exhibit normal vision. This was done through the use of a qualitative coding scheme to extract 2 criteria: items needed for recognition and perception of faces amongst ten individuals with DP. The results of the coding scheme demonstrated that all of the individuals used external cues such as environment, age, stylistic choice , hair, etc. to identify others. The second coding scheme was used to extract commonalities between how individuals saw the faces. This scheme showed three main themes: blurred faces, non-distinguishable facial features, and distinguishable facial features. Both of these qualitative results were used to create 3 visualizations of what individuals with the condition perceive based on the common themes examined between the ten individuals. These renditions were passed through Google AutoML's convolutional neural network VertexAI, which was trained using the CelebA dataset (public domain). The results demonstrated how 2 out of the three renditions negatively affected the network's ability to identify the images as faces (see Fig. 8 and Fig. 9). This study provides an overview of the condition from a perceptual point of view, which is vital in order to educate others about the implications of the condition.

Keywords: Developmental Prosopagnosia, Machine Learning, Convolutional Neural Networks, Facial Recognition

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THE EFFECT OF BMP SIGNALING IN THE TEMPORAL DYNAMIC OF INFECTION-INDUCED LIPID MOBILIZATION IN CAENORHABDITIS ELEGANS

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Bacterial infections negatively affect public health. Many organisms mobilize lipids as a source of energy to resist against pathogens. One pathway, the BMP pathway, plays a role in the regulation of lipid metabolism. By understanding the use of fat in cases such as loss of appetite in infection could serve as an early indicator of when an infection may occur. Preliminary data done by Ph.D student Katerina at Queens College demonstrate utilization of lipid as a form of resistance against pathogens, which was mobilized at 24 hours. Although innate immunity is the first line of defense against pathogens, the earliest immunity response is unknown. Therefore, the objective within this study is to determine the temporal dynamics of lipid alteration after pathogen exposure. To test this, two genotypes, wildtype (N2) and dbl-1 mutant of Caenorhabditis elegans, were exposed to the pathogen Serratia marsescens for defined time points: 18 hours, 19 hours, and 22 hours. Results showed exposure for 18 hours and 22 hours demonstrated no lipid mobilization ($p = 0.7289$ and $p = 0.1879$, respectively). Suggesting lipid and innate immunity was not yet mobilized at exposure times less than 22 hours. Further applications by exposing pathogen to day 1 adults and to C. elegans eggs from hatch, could determine whether lipid allocation may have had an impact on the study.

Keywords: BMP Signaling Pathway, DBL-1 Signaling Pathway, Lipid Metabolism, Innate Immunity

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Analyzing Possible Biological Links Between Laterality in Different Areas of the Brain and the Onset of Major Depressive Disorder

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ABSTRACT

Major depressive disorder (MDD) is a severe mental disorder identified as one of the most common mental illnesses. For 50 years, there has not been a full understanding of the brainâ€™s biology when depression occurs. To reach a conclusive outcome, 86 MDD patients were surveyed, given an MRI/PET scan, and treated with an antidepressant for 8 weeks. From such for my study, the Edinberg Handedness Inventory survey (EHI), PET Scan, and Hamilton Depression Rating Scale (HDS) were utilized to identify patient trends. The first survey used patient responses to determine the laterality of the brain. Out of the 86 patients in the study, 85% were right-handed, implying that analysis of patients would most likely represent those left-brained. With the HDS, each patient was given a number between 0 and +25 based on their response to their moods and habits. If the result was closer to 25, the severity of depression was greater. Based on the patient groupings from the HDS survey, FDG activity was analyzed in the left and right hemispheres of the amygdala. This region of the brain is brought into question due to its activity with MDD. When hyperactive, the amygdala causes .MDD symptoms

After taking the median of the FDG activity in each group, there was little laterality between each of the hemispheres, but in the right hemisphere, it was observed that the FDG was higher in patients who had an HDS of +25....This revealed that with a severe case of MDD, the .amygdala activity was higher

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THE EFFECT OF COLD-INDUCIBLE RNA-BINDING PROTEIN (CIRP) ON PHOSPHORYLATED CAMKII DOWNREGULATION

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ABSTRACT

Alzheimer's Disease (AD) is an irreversible neurodegenerative disease which affects more than six million Americans. Although the etiology of AD is unclear, studies suggest alcohol consumption as a risk factor for dementia requiring neurologists' aid. The prevalence of binge drinking worldwide is 16%. Research demonstrates binge drinking can release CIRP, a stress protein, from immune cells such as the microglia, to promote inflammation and inhibit neurological function. One essential function is synaptic plasticity. Synaptic plasticity, an important process of brain network development, relies on the activation of n-methyl-d-aspartate (NMDA) receptors. Activation of NMDA receptors results in calcium influx, most abundantly Calcium kinase II (CaMKII). Thus, this study measured phosphorylated CaMKII as an indicator of synaptic plasticity in HT-22 neuronal cell lines to determine CIRP's effects on phosphorylated CaMKII downregulation. HT-22 cell lines were differentiated and separated into control, CIRP, CIRP + NMDA 10', and CIRP + NMDA 30' treatment groups. A NMDA control consisted of a control, NMDA 10', NMDA 20', and NMDA 30' groups. These time intervals determined the ideal time of CIRP activation. Each CIRP treatment group was initially treated with CIRP and after four hours, designated groups were treated with NMDA in time intervals. After, tissue lysates were used for phosphorylated CaMKII protein quantification and western blot. The results demonstrate that CIRP did not significantly decrease phosphorylated CaMKII ($p = 0.9781$). This suggests CIRP did not effectively downregulate synaptic plasticity which would likely induce AD. Future studies can use cells that exhibit neuronal properties toclearly identify CIRP's effects.

Key words: Alzheimer's Disease, Synaptic Plasticity, CIRP, NMDA, CaMKII

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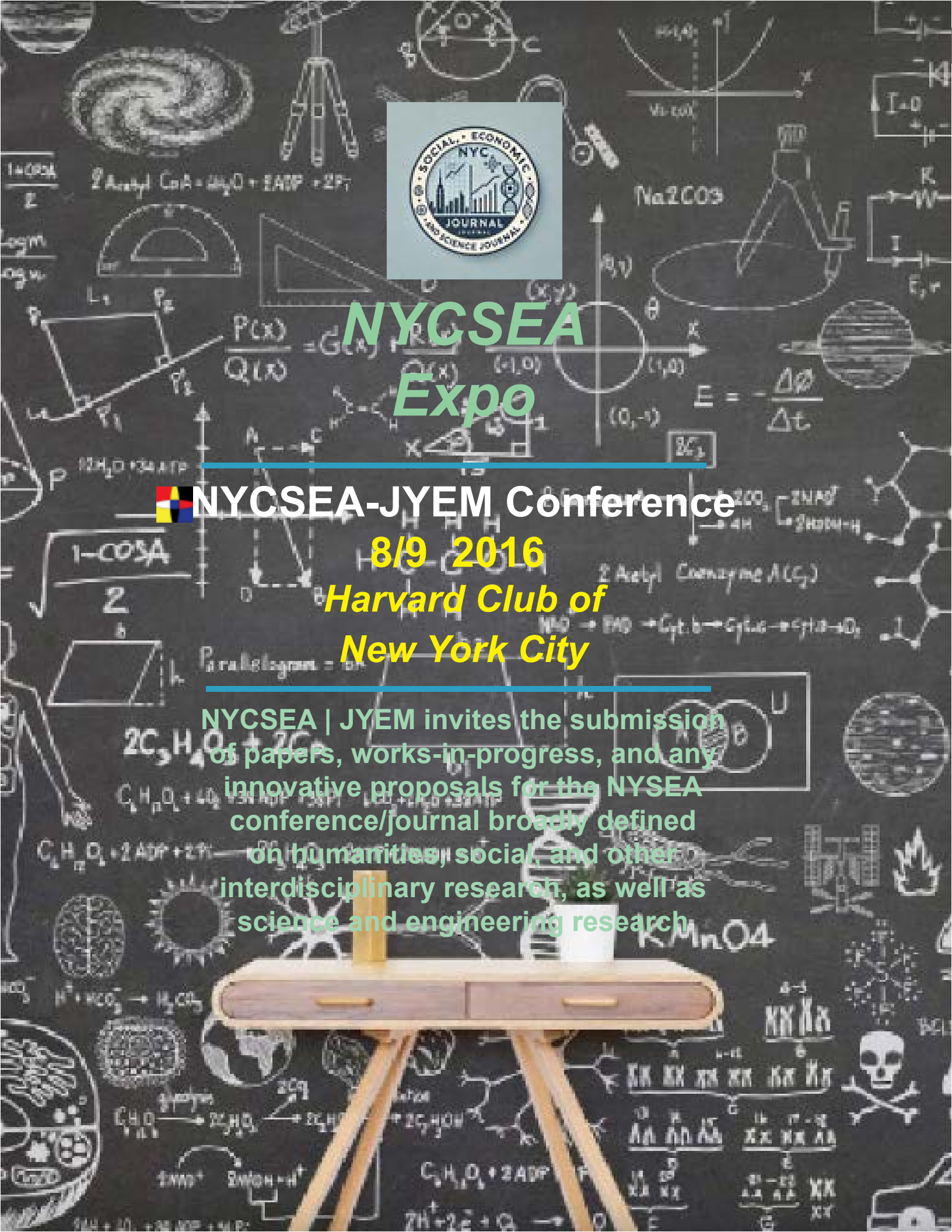
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