

Guajatacas water reservoir and Cabo Rojos Saltern microbial mats were cultivated on the appropriate M9NC, M-9G and M-9H, supplemented with Leucine and Thiamine for 48 hours at 37 Celsius. RESULTS/ANTICIPATED RESULTS: The culture-dependent approach showed a total of 6 potential bioprospects capable of growing on hormones as a sole carbon source on M9H at 25 and 37 Celsius and no-growth on the M-9 media used. Currently, we are in the process of determining the identities of the cultivable isolates genetically, any preference on hormone metabolization, monitoring a larger number of metagenomic clones and optimizing the selection conditions. DISCUSSION/SIGNIFICANCE: The identification of bioprospects capable of metabolizing hormones could potentially lead to the generation of new water treatments that could help remove unwanted chemicals, such as high concentrations of estrogens.

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Gender Differences in the Association of Impulsive Behavior and Susceptibility to E-cigarette Use among Adolescents with Congenital Heart Defects

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OBJECTIVES/GOALS: Adolescents with congenital heart defects (CHD) have an elevated risk for future cardiovascular events, but information about their risk for e-cigarette use ("vaping") is unknown. This study aims to present preliminary findings on gender differences in the association of impulsive behavior and vaping susceptibility from an ongoing investigation. METHODS/STUDY POPULATION: Adolescents with CHD (12-18 years; N=63) reported their vaping susceptibility and completed subjective (UPPS-P)/objective (Iowa Gambling Task; IGT) assessments of impulsive behavior previously associated with tobacco use. The UPPS-P includes 5 facets: 1) negative urgency (impulsivity under negative emotions), 2) positive urgency (impulsivity under positive emotions), 3) lack of premeditation (acting without thinking), 4) lack of perseverance (inability to focus), and 5) sensation seeking (seeking thrilling experiences). The IGT is a computerized task that creates conflict between immediate reward and delayed punishment via selections from advantageous/disadvantageous card decks. Linear regressions stratified by gender determined associations between vaping susceptibility and impulsivity. RESULTS/ANTICIPATED RESULTS: Nearly 30% (29.7%) of adolescents with CHD were susceptible to vaping. Negative urgency was associated with vaping susceptibility among females ($\hat{I}^2 = 0.44$, $p = .035$) but not males ($\hat{I}^2 = 0.25$, $p = .128$). Positive urgency was associated with vaping susceptibility among males ($\hat{I}^2 = 0.37$, $p = .021$) and trended toward significance among females ($\hat{I}^2 = 0.40$, $p = .058$). Lack of premeditation was associated with vaping susceptibility among males ($\hat{I}^2 = 0.36$, $p = .025$) but not females ($\hat{I}^2 = 0.15$, $p = .490$). The association between lack of perseverance and vaping susceptibility trended toward significance among males ($\hat{I}^2 = 0.30$, $p = .064$) but not females ($\hat{I}^2 = -0.18$, $p = .413$). IGT performance was not associated with susceptibility to vaping among either gender. UPPS-P facets and IGT performance were not significantly correlated. DISCUSSION/SIGNIFICANCE: The association of impulsivity and vaping susceptibility appears to be characterized by emotion-based rash action (positive/negative

urgency) for females and by decreased conscientiousness (lack of premeditation/perseverance) for males. If replicated, the findings have implications for assessment of vaping risk and tailored intervention.

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Unique Gray Matter Volume Differences in Bilingual Children with Reading Disability*

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OBJECTIVES/GOALS: Developmental dyslexia is a common reading disability (RD) which negatively impacts academic success. To address the role of early language experience on RD, we tested if the reported differences in gray matter volume (GMV) in RD also manifests in poor readers with a bilingual language background. METHODS/STUDY POPULATION: We studied 54 Spanish-English Bilingual Typical Readers with Oral Reading Recognition Test (ORRT) scores above 100 (avg. =113 $\hat{A}\pm$ 10), 51 Spanish-English Bilinguals with RD with ORRT scores below 92 (avg. =84 $\hat{A}\pm$ 7), 54 English Monolingual Typical Readers with ORRT scores above 100 (avg. =113 $\hat{A}\pm$ 10) and 51 English Monolinguals with RD with ORRT scores below 92 (avg. =84 $\hat{A}\pm$ 7) from the Adolescent Brain & Cognitive Development Study. All groups had an average age of 12 $\hat{A}\pm$ 0.7 years and were matched for sex and self-ratings of English ability. Structural magnetic resonance images were analyzed using Voxel-Based Morphometry and the bilingual and monolingual groups were separately compared in two-sample t-tests ($p < 0.05$). RESULTS/ANTICIPATED RESULTS: Monolinguals with RD had less GMV than the Monolingual Typical Readers in the right supramarginal gyrus (Brodmann's Area (BA) 40; MNI Coordinates: 69, -27, 39) ($p=0.011$) similar to the right superior temporal finding reported in the existing literature. However, a comparison of Bilinguals with RD and Bilingual Typical Readers did not show any GMV differences in superior temporal regions. Instead, our Bilinguals with RD had less GMV compared to the Spanish-English Bilingual Typical Readers in the right superior frontal gyrus (BA 11; MNI Coordinates: 21, 44, -24) extending to the middle frontal gyrus (BA 10) ($p = 0.014$). DISCUSSION/SIGNIFICANCE: Our findings suggest that the neuroanatomical bases of RD in Spanish-English Bilingual children are not the same as those observed for monolinguals, and biological models developed in monolinguals cannot be generalized. This has implications for diagnoses and treatment of RD in bilinguals.

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An Intrinsic Pathway in the Brain Underlying the Relationship Between Pain Catastrophizing and Chronic Pain in Temporomandibular Disorders

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OBJECTIVES/GOALS: Pain Catastrophizing is a negative coping mechanism involving rumination, magnification, and helplessness and is associated with worse chronic pain. The neurobiological mechanisms underlying this relationship are poorly understood.

We aim to examine the intrinsic activity of a functional pathway in patients with chronic orofacial pain. **METHODS/STUDY POPULATION:** This is the second phase of a parent study examining genetics, placebos, and the brain in temporomandibular disorders (TMD). We intend to recruit 120 of the original 398 TMD patients for this phase. Participants completed the Graded Chronic Pain Scale to assess TMD pain intensity and disability and the Pain Catastrophizing Scale. Behaviorally, pain catastrophizing scores and pain intensity and disability will be analyzed using structural equation modeling. Resting-state functional magnetic resonance imaging will be used to record intrinsic brain activity. The functional connectivity between the posterior cingulate, anterior insula, and periaqueductal grey will be assessed as a causal pathway relating pain catastrophizing to pain intensity and disability. Mediation analyses will be used to test causality. **RESULTS/ANTICIPATED RESULTS:** We anticipate that greater engagement in catastrophic thinking about pain increases the functional connectivity strength between the posterior cingulate, anterior insula, and periaqueductal grey, which ultimately leads to heightened perception of pain intensity and disability. Therefore, we expect to see increased functional connectivity in those with high pain catastrophizing levels as compared to those with low pain catastrophizing levels, and that this pathway will mediate the relationship between pain catastrophizing and pain intensity and disability. Further, we predict that helplessness will most strongly correlate with the change in functional connectivity as compared to rumination and magnification. Results will be presented in full at the conference. **DISCUSSION/SIGNIFICANCE:** Understanding how pain catastrophizing can influence chronic pain pathways will not only promote a more integrative approach to chronic pain management but will also help identify the mechanisms by which pain itself develops and persists in the particularly vulnerable pain population of TMD.

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Efficacy of the Insulin Infusion Calculator Protocol in the Optimization of Perioperative Blood Glucose Levels in the Cardiac Surgical Patients at UAB

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OBJECTIVES/GOALS: Insulin dosing is crucial for regulating blood glucose in cardiac surgery patients, yet it requires the use of cumbersome insulin dosing charts. To streamline this process, an electronic insulin calculator (IC) is trialed in the cardiac operating rooms and intensive care unit. This study compares glycemic control prior to and after institution of IC. **METHODS/STUDY POPULATION:** Using the EHR, a retrospective population of 3,164 cardiac surgery patient charts from 12/19/19 - 11/06/20 were obtained. Baseline, intra-operative, and ICU blood glucose values were obtained from each patients admission. Using this data, a baseline level of glycemic control throughout a cardiac surgery patients stay was established. A preliminary cohort of 244 patients were then chosen to be managed with the new IC. Baseline, intra-operative, and ICU blood glucose values were obtained in this group for comparison. Paired t tests were used to compare the IC group of patients to the retrospective group of patients. Additional subgroup

analysis was performed to assess IC efficacy for on pump vs off pump cardiac surgeries. **RESULTS/ANTICIPATED RESULTS:** The 244 patients managed with the IC showed significantly reduced average blood glucose values during their time in the ICU compared to those previously not managed with the IC (185 mg% vs 153 mg%, $p=0.02$). Additionally, a trend towards a reduction in last operating room blood glucose level was also noted. Lastly, average blood glucose levels were significantly reduced for patients undergoing on pump cardiac surgeries compared to off pump surgeries (157 mg% vs 149 mg%, $p=0.03$). **DISCUSSION/SIGNIFICANCE:** Preliminary results suggest IIC to be associated with better intra and postoperative blood glucose control. More data is being collected to test its association with outcomes.

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Semaphorin7a expression in breast cancer promotes susceptibility to immune checkpoint blockade*

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OBJECTIVES/GOALS: The goal of this study is to decipher the mechanisms by which breast cancers evade the immune system to facilitate metastasis through the lymphatic vasculature. We believe this is caused, in part, by semaphorin 7A (SEMA7A) as its expression is associated with increased lymphatic vessels, tumor-associated macrophages, and metastasis in breast cancer. **METHODS/STUDY POPULATION:** We have observed that breast cancer cells, lymphatics, and macrophages exhibit SEMA7A-dependent expression of PD-L1 in vitro, which may make SEMA7A+ tumors more sensitive to anti-PD-1/PD-L1 immunotherapies. Therefore, we utilized multiple orthotopic, immunocompetent mouse models to determine if SEMA7A expression makes tumors more susceptible to immune checkpoint blockade. E0771 and 66cl4 mouse mammary carcinoma cells were injected orthotopically into the #4 mammary fat pads. Once tumors reached 50-100 mm³ mice were injected intraperitoneally with 250ug of anti-PD-1, anti-PD-L1, or IgG control every third day. Tumors were measured with calipers every other day and harvested for flow cytometry to determine the effect of immune checkpoint blockade on the TME in SEMA7A+ tumors. **RESULTS/ANTICIPATED RESULTS:** We reveal that growth of SEMA7A overexpressing (OE) tumors, but not controls, was significantly slowed with both anti-PD-1 and anti-PD-L1 treatments. Flow cytometric analysis of cells from the TME revealed increased LECs, TAMs, and PoEMs in SEMA7A+ tumors, compared to controls – all populations had higher PD-L1 expression, which was decreased with both anti-PD-1 or anti-PD-L1. We also observed a decrease in PD-L1 expression on the tumor cells with treatment. Furthermore, LEC, TAM, and PoEM presence was decreased within the TME alongside increased presence of activated CD4 and CD8 T cells. Collectively, our results suggest that SEMA7A expression in breast cancers activates a major pathway associated with immune evasion and helps to establish a pro-tumor microenvironment. **DISCUSSION/SIGNIFICANCE:** SEMA7A expression establishes a pro-tumor microenvironment, which can be targeted with readily available FDA approved drugs such as immune checkpoint-based therapies. Since SEMA7A+ breast cancers have high rates of metastasis, more specific treatments for these patient populations should be explored.