TRANSFORMING MEDICINE ONE DOCTOR AT A TIME

USC School of Medicine Greenville

4th Annual Student Research Symposium

Undergraduate Session Abstracts

A Case Report of Saint's Triad and the Diagnostic Implications for Clinicians

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Study Design- Case Report
Objective- Raise awareness of the Saint's Triad as a disease in the field of biomedicine. Encourage medical professionals to note that a single pathology in patients can be associated with other pathologies. Overall, encourage wholesome patient examination during diagnosis.
Methods- Two cadavers, one assumed to be affected by Saint's Triad (Cadaver #1) and one unaffected (Cadaver #2), were dissected in the same way using similar dissection instruments. After initial dissection, specific body structures were identified in both cadavers. Areas of the body related to Saint's Triad and the heart were evaluated. A measuring tape was used to measure distance from landmarks and to quantify the size of certain body structures. A camera was used to take pictures to review afterwards.
Findings- Cadaver #1 had an abdominal aorta greater than 3cm, which exceeds the current standard. Additionally, a hiatal hernia was observed, but no inguinal hernia. Overall, the cadaver presumed with Saint's Triad had features consistent with the syndrome.
Conclusions- Findings in the lab lead to the suspicion of Saint's Triad. Research has identified that Saint's Triad is linked to connective tissue disorders. Medical professionals responsible for diagnoses should be aware of the likelihood of multiple pathologies in one patient. The Saint's Triad encourages wholesome patient examination. The aim is to motivate clinicians to investigate more than what a patient presents with leading to better patient outcome.

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Expression Levels of Serum Creatine Kinase BB Isoenzyme in Aging Females at Different Stages of Breast Cancer

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Creatine Kinase BB (CK-BB) isoenzyme activity is elevated in many tumors including those of the breast. The purpose of this research is to examine the relationship between aging females experiencing different stages of breast cancer and Creatine Kinase (CK-BB) isoenzyme levels. This investigation involved a thorough review of the scientific literature and the use of the extremely sensitive and specific Helena Labs SPIFE Touch Gel Electrophoresis and Analysis system's method. The aim of this investigation is to show a direct connection between breast cancer, aging and Creatine Kinase Isoenzyme levels in various human female age groups. In one published review, 135 patients (27 women in each group from 30 to 70 years of age) were evaluated who had higher CK levels also had favorable progression-free survival (PFS), while the elevated CK patients appeared to gain better PFS. Patients were staged according to the International Union Against Cancer post-surgical tumors-node-metastasis (pTNM) classification. The National Cancer Institute estimates that 12.9% of women born in the United States will be diagnosed with breast cancer females and high serum Creatine Kinase levels. In conclusion, women who have breast cancer may develop high CK-BB specific activity levels.

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Expression Levels of Lactate Dehydrogenase-1 in Aging Females with Triple-Negative Breast Cancer

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Lactate Dehydrogenase (LDH) serves as a clinical marker for the onset of various diseases in humans. The purpose of this research is to evaluate LDH-1 (H4) isoenzyme levels in whole body tissue extracts of Medaka fish exposed to low-dose radiation. These isoenzyme levels will be compared to the onset of breast cancer and aging. Total protein concentrations were determined using the bicinchoninic acid (BCA) protein assay method. The design of this project was to use the Helena Labs SPIFE Touch Gel Electrophoresis and Analysis System to measure LDH-1 levels. LDH-1 levels were first measured in none-radiation exposed control fish and normal human serum LDH isoenzyme standards. Lactate Dehydrogenase-1, coded by the *ldh-b* gene, is a component of glycolytic metabolism and an essential gene in triple-negative breast cancer. Triple-negative breast cancer cell lines are more dependent on glycolysis for their growth. LDH-1 is upregulated in triple-negative breast cancer, which suggests that the tumor is glycolytic. Patients with breast cancer and high LDH-1 expression levels will have poor clinical outcomes. Targeting LDH-1 will serve as a clinical benefit in the diagnosis of triple-negative breast cancer.

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The Biochemical Characterization of Lactate Dehydrogenase Activity on Breast Cancer Treatment Strategies

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Lactate Dehydrogenase (LDH) is a clinical marker for the onset of various human diseases. This research aims to analyze how the prognostic role of serum LDH C (C4) in patients with breast cancer affects treatment strategies. Total protein concentrations were determined using the bicinchoninic acid protein assay method. The design of this project was to use the Helena Labs SPIFE Touch Gel Electrophoresis and Analysis System. The analysis system allowed for the normal serum levels of LDH to be observed and then compared to those observed in breast cancer patient studies. Recent research has demonstrated that LDH C helps cancer cells survive by preserving the DNA damage repair system. Consequently, LDH C targeting can result in cancer cell death with minimal off-target consequences. In addition, basal-like breast cancer (BC), a subtype with a poor prognosis, exhibits unusually elevated levels of LDH C expression. Interestingly, worse survival rates in these patients have been demonstrated to be associated with increased LDH C expression. Furthermore, it has been observed that increased LDH C expression reduces the activity of tumor-infiltrating lymphocytes. Transcriptome analysis revealed that this characteristic was driven by several pathways associated with cell growth, proliferation, and immunological regulation. Therefore, by blocking these

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Biofilm formation by Serratia Marcescens Using Lux I and Lux R Mutants

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Bacterial keratitis is an infection of the cornea that is caused by bacteria and usually develops quickly. If left untreated bacterial keratitis can cause blindness. The main risk factors of bacterial keratitis in the US are poor contact lens hygiene, extended wear of contact lens beyond what is recommended or corneal injury. *Serratia marcescens* is a gram-negative bacterium that is the third most common cause of bacterial keratitis. It can form biofilms on contact lens and lens cases. Biofilm formation is controlled by quorum sensing systems. Four different LuxI—LuxR like quorum sensing systems have been identified in *Serratia* species. LuxI is the acyl homoserine lactone (AHL) synthase that makes the signaling molecule AHL and LuxR is the regulatory protein that binds to the AHL. The system works together to control the expression of a group of genes as the number of bacteria increases. The purpose of this project is to characterize biofilm formation by a *S. marcescens* clinical isolate using the *luxI* and *luxR* mutants. One aim of the research is to create a new plasmid that has the *luxI* gene or the *luxR* gene cloned into it separately. The methods used to create the two plasmids that have the *luxI* or *luxR* gene are polymerase chain reaction (PCR) and gel electrophoresis, ligation, and the transformation of the plasmids in the appropriate mutant. The second aim will be to test the strains for biofilm formation.

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The Effects of E-liquids With Nicotine and Without Nicotine on Caenorhabditis elegans

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A survey conducted by the Center for Disease Control and Prevention determined that 320,000 middle school students and 1.72 million high school students used e-cigarettes in 2021. Also, the report stated that 84.7% of the current youth e-cigarette users used flavored e-cigarettes. E-cigarettes do not contain tobacco but most of them contain nicotine. The current study will use a chemotaxis assay to determine the effects of flavored e-liquids with nicotine and flavored e-liquids without nicotine on N2 Bristol *C. elegans*. The e-liquids were purchased at a local vape store in Columbia, SC and consist of the following flavors: Mars Melon (watermelon), Deep Blue (blueberry), Planetary Peach (peach). The *C. elegans* will be exposed to the various flavors of e-liquids, sterile water, propylene glycol (PG), vegetable glycerin (VG), and nicotine. The e-liquids will be diluted to a 10:1 ratio with sterile water. Nicotine, PG, and VG will be diluted to coincide with the amounts in the diluted e-liquids. The chemotaxis plates will contain a diluted e-liquid, PG, VG, or nicotine along with sterile water and the *C. elegans*. The plates will be placed in an incubator at 25°C for 1 hour and then placed on ice. After 10 minutes, the first plate will be removed and the *C. elegans* will be counted and recorded using a chemotaxis index (Margie et al., 2013). The *C. elegans* on the remaining plates will then be counted. Three experimental replicates will be performed at different times for each flavored e-liquid and the controls.

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Comorbidities of ischemic stroke patients with a history of diastolic blood pressure treated in a Telestroke Network; accessing improving or worsening neurological functions

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Objective: This study determined risk factors associated with neurological functions in acute ischemic stroke (AIS) patients with a history of elevated diastolic blood pressure (DBP).
Material and Methods: Data for this study were obtained from the stroke registry of Prisma Health Upstate between 2010 and 2016. DBP was stratified as < 80 mmHg or ≥ 80 mmHg. Stroke severity was evaluated using NIHSS scores ≤ 7 for improving and >7 for worsening neurologic functions.
Results: Total of 52.9% AIS patients presented with a DBP <80 mmHg, while 41.7% presented with a DBP ≥ 80 mmHg. Patients with a DBP ≥ 80 mmHg, presented with hypertension (OR = 3.453, 95% CI, 1.137-10.491, P = 0.029), history of smoking (OR=2.55, 95% CI, 1.06-6.132, P=0.037), and increased heart rate (OR=1.036, 95% CI, 1.009-1.064, P=0.009) with worsening neurologic functions. Caucasians (OR=0.294, 95% CI, 0.090-0.964, P=0.002) and obesity (OR=0.455, 95% CI, 0.207-1.002, P=0.05) were associated with improving neurologic functions. Patients with DBP < 80 mmHg that presented with increased heart rate (OR = 1.025, 95% CI, 1.001-1.050, P=0.042) were associated with worsening conditions, while obesity (OR = 0.388, 95% CI, 0.182-0.828, P=0.014) was associated with improving conditions.
Conclusions: Finding identified risk factors that can be managed to improve the care of AIS patients elevated DBS treated in the Telestroke Network.

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Identification of genes associated with successful IVF outcomes from Women of Advanced Maternal Age

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Introduction: A patient may seek the use of IVF technology when they are struggling to become pregnant. To improve IVF outcomes, there's much research focused on identifying markers to allow embryologists to transfer embryos with the greatest chance of a successful pregnancy. Women of advanced maternal age, which is thirty five years and older have a lower chance of success on a first attempt with IVF, women at the age of 40 have a 9% chance of a live birth with IVF. Therefore, identification of an additional biomarker during preimplantation development that's associated with successful implantation in AMA patients, may provide another metric to use when selecting the most viable embryo for transfer.
Methods: Blastocoel fluid-conditioned media was collected from day-5 IVF-embryos that underwent PGT-A. RNA was purified from individual blastocoel fluid samples and then cDNA was synthesized. RT-qPCR was then performed to assess levels of SHARPIN in 64 IVF-embryos with known implantation outcomes and age of mother. Genes selected for analysis in this study were identified in a previous RNASeq analysis from another set of blastocoel fluid samples.
Results: Initial results suggest that the SHARPIN gene shows increased expression on 128 samples.
Conclusions: Analysis of expression of SHARPIN was associated with successful implantation outcomes in AMA patients in this preliminary analysis. SHARPIN functions as a ubiquitin ligase. Determining which genes are expressed in the blastocoel fluid from AMA patients with successful outcomes may lead to an additional embryo selection tool for other AMA patients utilizing IVF.

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Regional brain structure reflects the influence of Traumatic Brain Injury (TBI) in the Alzheimer's Disease Neuroimaging Initiative sample

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It is well understood that traumatic brain injury (TBI) is correlated with an increased likelihood of developing Alzheimer's Disease (AD) in the future. The Alzheimer's Disease Neuroimaging Initiative (ADNI) MRI group works to understand the effects of TBI on physical brain structure to better understand if TBI shares similar pathologic features with ADD, causes AD, or accelerates existing AD pathologies. This study paired 37 self-reported TBI+ subjects from the ADNI database matched with TBI- subjects controlled for age, sex, and level of AD pathology, as measured by the SUVr index, in order to ensure that the pathophysiological differences between the subjects can be attributed to TBI status, and not existing to AD biomarkers. Only subjects who had an SUVr index of 1.2 or greater were included. The study examined the differences in regional and whole brain volume, cortical thickness, regional curvature, surface area, and overall morphology of regions-of-interest commonly associated with AD, retrieving volumetric and physiological data from subject sMRI and neuroimaging software such as Freesurfer. The data analysis is still in progress, and as such, it is premature to make assumptions yet. However, based on the data that has been gathered thus far, it appears that there may be some strong clinical implications. If TBI is associated with physical changes in signature regions of Alzheimer's Disease, then researchers and clinical professionals will be able to better understand the mechanisms of AD, paving the way for future development of preventative treatments.

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Stroke Outcome Optimization Study

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Ischemic strokes, the most common type of stroke, causes blocked blood vessels, which are apt to become damaged or destroyed if the blockage is not resolved. When the stroke affects the left side of the brain, language-processing and speech production areas can be damaged, resulting in aphasia. Aphasia is a language disorder that hinders written comprehension and understanding of spoken language, which can significantly impact several aspects of the stroke survivor's daily living functions. This research aims to create a reliable prediction model by utilizing a comprehensive assessment battery of cognitive, behavioral, and functional assessments to improve aphasia outcome predictions for comprehensive stroke centers across the US to use in their evaluations. In the first part of this study, data from 1976 acute ischemic stroke patients treated at a single comprehensive stroke center from 2019 and 2020, who fulfilled the study inclusion/exclusion criteria, were analyzed and abstracted. The records were abstracted from the text-based data to numbers-based data through multiple data collection applications utilizing GWTG (Get With the Guidelines) quality assessments to ensure confidentiality and reliability. Currently, speech pathology notes from the clinical evaluations are in the process of abstraction. The next step of research is to recontact the survivors or their Legally Authorized Representative so that they can be reassessed in the chronic phase of aphasia for the prospective aspect of the study. Based on these evaluations, combined with the MRI data, the prediction tool can be developed by utilizing machine learning techniques that ensure reliability and reproducibility.

Investigating the Anti-Apoptotic Effects of IFIT3 during Respiratory Infection in a CRISPR-Generated IFIT3 Knock-Out Cell Line

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Interferon Stimulated Genes (ISGs) were first identified to be upregulated during the innate intracellular antiviral immune response, though many of their functions are still largely unknown. One such gene, Interferon Induced Protein with Tetratricopeptide Repeats 3 (IFIT3) is presumed to inhibit apoptosis of infected cells during the immune response to viruses, such as SARS-CoV-2, and bacteria, such as *Acinetobacter baumannii.* However, this has not been confirmed and the mechanism by which IFIT3 could inhibit apoptosis is not yet clear, particularly in the context of respiratory infection. In the present study, CRISPR-Cas9 plasmids with guide RNA for IFIT3 were used to generate IFIT3 genomic mutations in the respiratory epithelial cell line, A549. IFIT3 knockout cell lines were confirmed with genomic PCR and western blotting, while cell lines that did not successfully knock out IFIT3 were identified to serve as controls. Knockout and control cell lines were treated with Poly I:C, a mimic of viral RNA, to stimulate an immune response. Changes in apoptotic biomarkers were observed and quantified via fluorescent microscopy and western blotting. Understanding the effect that IFIT3 has on apoptosis during the intracellular immune response will provide us with a better understanding of pathways important in the defense against many classes of respiratory infections.

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Analysis of the expression of both ubiquitin and histone proteins in blastocoel fluid from IVF embryos is correlated with positive implantation

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Background: Due an influx of patients seeking infertility treatments like IVF, the need to identify additional molecular markers, particularly proteins, in preimplantation embryos to predict successful implantation is essential. Candidate proteins include ubiquitin and histones. By studying the expression of these proteins in blastocoel fluid samples associated with known implantation outcomes, embryologists eventually may predict the implantation potential of a given embryo.
Purpose: To assess expression of proteins from the ubiquitin-proteasome family as well as histones in blastocoel fluid-conditioned media from IVF-embryos with known implantation outcomes.
Methods: Blastocoel fluid conditioned media samples were collected from day-5-IVF embryos at the times of PGT-A biopsy. Media associated with embryos of poor morphology versus good morphology were used in this study. Total RNA and protein concentration were assessed with an Agilent Bioanalyzer. Blastocoel fluid-conditioned media samples were pooled and loaded onto a NuPAGE protein gel to detect total proteins with Colloidal Blue staining and then for Western Blots. Antibodies to detect ubiquitin and histones were used for the blots.
Results: Preliminary results suggest that proteins can be detected in pooled blastocoel fluid conditioned media samples based on Colloidal Blue staining. The initial Western Blot assay detected some expression of ubiquitin.
Conclusions: I hypothesize that the euploid grade AA embryos will present with stronger markers of histone and ubiquitin proteins as well as a higher concentration of protein in the blastocoel fluid, providing evidence that the embryos with stronger markers of said proteins will result in a successful implantation.

Prisma HSC Seed Grant

Disruption of the Extracellular Morphogenesis of Cardiac Tissues in two Avian Models of Cyanotic Heart Defects

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Affiliations Collagen fibers are large extracellular matrix (ECM) proteins that are essential for proper valve function. During the formation of cardiac valves, an intricate network of collagen fibers develops that allows for unidirectional blood flow and prevents regurgitation. Using two different models of induced cyanotic heart disease, Tetralogy of Fallot (TOF) and Persistent Truncus Arteriosis (PTA) we sought to determine if the collagen network of the semilunar valve tissue was disrupted during fetal development as compared to controls. Transmission electron microscopy was carried out on Hamburger and Hamilton stage 42 (day 16) aortic (Ao) and pulmonary (Pul) valves so that the collagen fibers could be visualized and quantified. Image analysis was carried out using ImageJ to determine collagen fiber diameter. Statistical analysis consisted of two-tailed, unequal variance T Tests to find significant differences between the groups. The collagen diameter of Ao TOF A was significantly ($p<0.05$) smaller than all other groups, whereas Pul TOF B was significantly higher than the other groups. Interestingly, Control Pul valves had smaller mean collagen diameters than Control Ao valves. This study found that there are significant differences in the mean collagen fiber diameter between controls and cyanotic valve tissue during the late stages of fetal development. This indicates that the valve tissue in structural heart defects such as TOF and PTA initiate pathological development of the collagen fiber network while in utero. Determining the etiology and mechanisms of this process will lead to earlier interventions that improve outcomes for these deadly disorders.

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Gender Difference in Risk Factors of Ischemic Stroke Patients with Coronary Artery Disease

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Objective: Gender differences among acute ischemic stroke (AIS) patients with coronary artery disease (CAD) included or excluded from recombinant tissue plasminogen activator (rtPA) therapy is not fully understood. This study aims to determine risk factors contributing to a gender difference in the exclusion of AIS patients with a history of CAD (AIS-CAD) from thrombolytic therapy.

Methods: We analyzed six years of data collected from 663 AIS patents using the PRISMA Health Upstate SC stroke registry. Binary logistic regression was used to determine risk factors associated with inclusion and exclusion from rtPA in AIS-CAD men and women patients. Our model was tested using the Hosmer-Lemeshow test for the overall correct classification percentage, while interactions and multicollinearity between independent variables were examined using variance inflation factors

Results: In the adjusted analysis, heart failure (OR=0.282, 95% CI, 0.079 – 1.006, *P*=0.051) and the use of antihypertensive medications (OR=0. 317, 95% CI,0.101 – 0.994, *P*=0.049) were associated with men AIS-CAD patients excluded from rtPA. Previous stroke (OR=0.198, 95% CI,0.0.050 – 0.779, P=0.020), and independent ambulation (OR=0.231, 95% CI, 0.072 – 0.743, *P*=0.014) were associated with women AIS-CAD patients that were excluded from rtPA therapy.

Conclusion: Our findings identified risk factors associated with gender differences in AIS-CAD patients excluded from rtPA. To improve clinical outcomes, management strategies should consider identified factors in the care AIS-CAD patients with rtPA therapy.

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Comparing the effects of Pharmacological and demographic factors between men and women patients diagnosed with Late and Early-Onset Alzheimer's Disease

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Objective: The current study investigates differences in men and women patients with Late-onset Alzheimer's disease (LOAD) and Early-onset Alzheimer's disease (EOAD)
using pharmacological and demographic factors.

Method: Data for this study was collected from the Prisma Health Upstate Alzheimer's patient registry between 2016-2021. Multivariate analysis was used to predict pharmacological and demographic factors associated with men and women with LOAD and EOAD.

Results: A total of 91.7% LOAD and 8.3% EOAD patients were identified. In the adjusted analysis, men AD patients that were administered memantine [OR=1.588, 95% CI, 1.175-2.145, p=0.003], and buspirone [OR = 1.971, 95% CI, 1.221-3.183, p=0.006] were more likely to be associated with EOAD, increasing age [OR = 0.816, 95% CI, 0.799-0.834, p<0.001] was associated more with LOAD. In women with AD, ETOH use was more likely to be associated with EOAD, increasing age [OR = 0.845, 95% CI, 0.834-0.857, p<0.001], memantine use [OR = 0.774, 95% CI, 0.627-0.956, p=0.017], African Americans [OR = 0.621, 95% CI, 0.462 – 0.835, p=0.002] and tobacco use [OR = 0.529, 95% CI, 0.424-0.660, p<0.001] were associated with LOAD.

Conclusion: Our findings identified specific demographic and pharmacological factors that were associated with men and women with LOAD and EOAD. These findings suggest the need to develop strategies to eliminate disparity in the care of LOAD or EOAD patients.

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Towards the Development of a Self-Organizing Neural Unit to Model an Ischemic Stroke and Other Neuropathology

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Background: Animal models and monolayers of cells in culture have limitations to accurately model human disease. This is particularly true for neuropathology. Combining new imaging and 3D cell culture technologies, a perfusion bioreactor system has been designed to investigate mechanisms of ischemic stroke and repair. This will serve as a new platform to test novel clinical interventions that will improve stroke outcomes, by considering both the pathology and physiology of a stroke. Specifically, for this project, astrocyte/endothelial interactions that drive fibrotic repair will be investigated.

Method: The flow chamber for the bioreactor was created using SOLIDWORKS software and printed. The printed flow chamber includes a mold for casting collagen hydrogels that contain mixtures of astrocytes, HUVECs, and neurons. The ability of flow to generate a Self-Organizing Neural Unit (SONU) will be analyzed. Ischemic stroke and reperfusion injury is modeled by stopping and re-initiating flow while being imaged. Dynamic imaging allows the determination of the scope and magnitude of vascular injury for different insults.

Expected Results: Creeping flow will stimulate the development of neural capillary beds or SONUs, which are expected to model the pathophysiology of ischemic stroke including molecular markers of cerebral vascular damage.

Conclusion: A functional platform that models the cellular interactions during ischemic stroke and reperfusion injury could be used to test agents that mitigate astrocyte-mediated fibrosis and stimulate neural regeneration would accelerate stroke research and aid in stroke recovery.

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Effects of Neointimal Hyperplasia in Vascular Grafts

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Vascular grafts are an essential part of medical practices today for issues in the circulatory system. As the practices for using grafts becomes more common it is important to measure not only the graft's success but also, what can cause them to fail. One of the most common causes of vascular graft failure is neointimal hyperplasia which is an accumulation of cells on a vascular wall which can lead to conditions such as restenosis and ultimately graft failure. Using a pulsatile perfusion bioreactor, I plan to simulate flow in a vascular graft and to identify areas where neointimal hyperplasia may occur. A Particle Imaging Velocimetry (PIV) software will be used to display the velocities of several particles as they travel through the bioreactor. A silicon mold will be used to model a vascular graft and future testing will use live veins harvested from pigs. My results show that graft failure is most likely to occur in the second half of the graft due to the particles having a lower velocity in than the first half of the graft. Increasing the pressure of the system from the arterial environment of a pig (86 mmHg on the low end) to that of a human's (120 mmHg on the high end) provided consistent results at the area where neointimal hyperplasia could occur. These results show that it is important to continue to test vascular grafts of other organisms before a procedure but my results have provided some evidence that they are compatible. There is still much work to be done with future testing of end of side anastomosis vascular grafts.

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Decellularization of Porcine Saphenous Veins

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Introduction: Autologous saphenous vein grafts are the most common bypass solutions for coronary artery bypass surgery, although these small-diameter vessels are not always attainable. Alternatively, xenologous grafts can be produced through decellularization and recellularization of porcine saphenous veins. Decellularization leaves behind a protein-rich scaffold suitable for cellular attachment and proliferation providing the opportunity to create patient specific grafts. The efficiency of decelling and physical quality of the scaffold need to be evaluated as these factors influence the success of cell seeding.

Materials and Methods: Porcine saphenous veins obtained from Clemson's on-campus research facility, Godley Snell, were cleaned then fixated in a perfusion bioreactor. The veins were perfused for 24 hours twice, changing the solution between cycles. The efficiency of the removal of the cellular components was evaluated through Hematoxylin and Eosin (H&E) staining to visualize the nuclei present in native and decellularized tissues. The DNA content was quantified using the Thermo Scientific GeneJET Genomic DNA Purification kit.

Results and Discussion: The imaging and staining performed determines the preservation of the collagen and elastin fibers in the scaffold. The preservation of proteins demonstrates the potential for the scaffold to be used for tissue growth. Use of the DNA kit indicates successful removal of the genetic material from the porcine vein. This testing indicates the capability of the scaffold to be used for tissue growth.

Conclusions: Effectively removing the cellular components and genetic material of porcine saphenous veins while maintaining structural integrity allows for tissue regeneration for cardiovascular graft applications.

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Stroke Risk Factors Associated with Gender Differences in Ischemic Stroke Patients With Diabetes

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Purpose

The role that specific factors play in contributing to gender differences in the exclusion of Acute Ischemic Stroke patients (AIS) from thrombolytic therapy is not yet fully understood. In this study, we tested the hypothesis that specific risk factors may contribute to gender difference in the exclusion of Ischemic Stroke patients with a history Diabetes from thrombolytic therapy

Methods

Data collected for 6 years from the PRISMA Health Upstate SC stroke registry was analyzed. Multiple regression analysis was used to determine risk factors associated with inclusion and exclusion for thrombolytic therapy (i.e tPA administration) in the total stroke population and the subsets of the male and female population. The regression model was tested using the Hosmer-Lemeshow test, for the overall correct classification percentage. Significant interactions and multicollinearity between independent variables were examined using variance inflation factors.

Results

In the adjusted analysis, women stroke patients with a history of diabetes that presented with National Institutes of Health Stroke Scale (NIHSS) scores less than 7 (OR=0.195, 95% CI, 0.070-0.539, P=0.002) were more likely to be excluded from thrombolytic therapy.

Conclusion

Stroke severity was the major factor that was associated with gender differences among the AIS diabetic stroke population. Management strategies should consider identified factors to provide better care and improved outcomes for AIS patients with a history of diabetes.

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The Effects of Different Vitamin B12 Forms on Aging and Neurological Disorders

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Recent studies indicated that Vitamin B12 has led to deficiencies in elderly patients with overexposure of high levels of treatments through grain fortification, supplements, and injections; which lead to hypocobalaminemia. Vitamin B12 is a metabolite of folic acid, it adds a one carbon methyl group that leads to DNA methylation.

We used three different forms of vitamin B12: +2 Cobalt, +3 Cobalt, and cobamamide. To see how excess vitamin B12 levels affect human nerve cells, each form was given twice the normal amount. The cells used in this study were given less nutritious cell food so that they would take up more of the vitamin B12s. There are four treatment groups: a negative control, +2 Cobalt cyanocobalamin, +3 Cobalt cyanocobalamin, and cobamamide. The target genes to study are DNA methyltransferase 3A (DNMT3A), DNA methyltransferase 1 (DNMT1), and methyl-CpG binding protein 2 (MECP2). We hypothesized that there are various gene expressions that are involved in epigenetics regulation, and how it affects Vitamin B12 in aging studies. Upon completion of this project, we hope to have a better understanding of the effects of overconsumption of B12 on patients with B12 deficiencies.

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Stroke Outcome Optimization Project (SOOP) Imaging

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The Stroke Outcome Optimization Project (SOOP) Imaging group works to understand how strokes damage the brain and its associated recovery. As part of a larger project creating an outcome prediction model to analyze post-stroke patient data, the Imaging group focuses on brain extraction techniques that allow for the measurement of stroke size and anatomical location. These techniques contribute to the ability to create reproducible aphasia outcome prediction models that can be implemented at comprehensive stroke centers throughout the United States. As a result, medical professionals can better track the effectiveness of new treatments for aphasia and other outcomes of stroke in patients. Stroke masks are created in order to inspect hundreds of patient data from the Get with the Guidelines (GWTG) dataset efficiently, allowing the analysis to be automated in the future outcome prediction model. In collaboration with the Observational group, data abstracted from GWTG subject notes, EPIC charts, and MRI scans combine to provide an optimized perspective on a patient's prognosis post-stroke. While fine-tuning the neuroimaging techniques needed for this analysis, the group is examining radiological reports to understand the anatomical and physiological impact of a stroke. In addition, data are labeled in a simple way so that they can easily be linked back to the radiological reports. Future work will consist of obtaining measurements from the brain images to contribute to the outcome prediction model.

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Durability of Type II Heat-Labile Enterotoxins Effects on Respiratory Immune Responses

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The increasing prevalence of highly contagious respiratory illnesses such as COVID demonstrate a need for investigation of innovative vaccines and drugs. Heat-Labile Enterotoxins (HLTs) are secreted bacterial proteins (*Escherichia coli* and *Vibrio cholerae*) with unique immunomodulatory properties. Type II HLTs, made by specific strains of *E. coli*, are known to act as mucosal and systemic adjuvants. The goal of the study is to investigate the impact of three types of Type II HLTs (LT-IIa, LTII-b, and LT-IIc) on respiratory specific immune responses to determine their feasibility as vaccine adjuvants. To investigate enterotoxin-mediated immunostimulation, cultures of the human lung epithelial cell line, A549, were stimulated with the Type II enterotoxins for six or eighteen hours. Immune responses were evaluated via qPCR to quantify RNA expression and ELISA for cytokine secretion. These enterotoxins were also studied for their ability to modify the effects of LPS, a known stimulator of the inflammatory immune response. The addition of HLTs resulted in no significant changes to viability with or without LPS. Secretion of IL-1β was decreased in the presence of HLTs and reduced expression of IL-6 was observed on an mRNA level. Gene expression over a six hour period found that immune responses triggered by HLTs significantly differed from that induced by LPS.

Prisma Seed Grant

Investigating the prognostic value of fMRI images on individual response to rTMS treatment for schizophrenia

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Repetitive transcranial magnetic stimulation (rTMS) is a noninvasive procedure used for treatment of schizophrenia. This technique uses magnetic pulses to create an electric current that stimulates target deep brain tissue. Current literature demonstrates successful treatment of schizophrenia related auditory hallucinations with use of rTMS. It can be difficult to select patients who have failed pharmacologic treatment for this novel procedure. Functional magnetic resonance imaging (fMRI) can be used to demonstrate areas of brain activation with rTMS treatment. The purpose of this study was to correlate fMRI data with treatment outcomes to identify possible physiologic predictors of successful treatment of schizophrenia-related auditory hallucinations with rTMS. A case-control study was performed using imaging and clinical data collected from The National Institute of Mental Health Data Archive. fMRI images were processed using FreeSurfer, a software that allows for analysis of blood flow, brain volumes, and hemodynamic responses to rTMS treatment. The temporoparietal junction was an area of focus as it has been linked to increased activity in schizophrenic patients with auditory and verbal hallucinations. Though still in the process of data analysis, we expect to see a difference in areas of changed blood flow in patients who are successful with rTMS treatment and those who are unsuccessful. We hope that our results will contribute to the efficacy and predictability of rTMS treatment of auditory hallucinations in patients with schizophrenia.

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Gender, smoking behaviors, and bilingualism presenting as demographic risk factors for traumatic brain injury in the Alzheimer's Disease Neuroimaging Initiative database

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A history of traumatic brain injury (TBI) and Alzheimer's disease (AD) is postulated to be intertwined, thus labeling TBI as a risk factor for AD. This may be due to the structural damage that TBI causes within the brain. While some demographic characterization between TBI+ and TBI- patients exist, their association to Alzheimer's disease is poorly understood. This study pulls from the Alzheimer's Disease Neuroimaging Initiative (ADNI) database to examine numerous demographic markers and their influence on AD outcomes. A total of 1181 patients in the ADNI database were examined, with 62 of them being TBI+. Chi-square analyses showed gender and smoking differences, with males having a higher chance of sustaining a TBI, as well as patients who engage in smoking behaviors. A trend appears in bilingualism with only English-speaking AD patients having a history of a TBI; however, this correlation may be due to the lack of non-English speaking patients, thus requiring future research with more diverse populations. A definitive assessment of other demographic correlations remains uncertain, but trends found in this study reaffirm previous speculations. Research places men at a higher risk for TBI as they participate in more high-risk behaviors. Further, smoking is found to be a risk for and consequence of TBI, as well as a risk factor for AD. Overall, the findings in this study may improve the diagnostic criteria for AD and provide guidance to researchers and physicians on the development of early interventions for those with at-risk demographics.

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