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O.U.R. 2024 FALL CONFERENCE

November 15, 2024

Location: **Galloway – Business bldg.**

Book of Abstracts

Part II - Poster Presentations

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Locations: **Galloway – Business bldg. – Hallway – 1st floor**

You will mount the posters on Thursday, 11/14 starting at 2:30pm until 5:30pm.

We prefer that you drop the poster in Archer 100D, on Wednesday 11/13 from 9 am until 7pm, or Thursday, 11/14 from 9am to 12pm.

We can take care of mounting the posters.

Poster Session I – 8:00 A.M. to 8:45 A.M.

Poster Session II – 12:30 P.M. to 1:00 P.M.

Poster Session III – 3:15 A.M. to 3:45 P.M.

All sessions are mandatory. If limited availability, please let know cbahrim@lamar.edu

Glossary:

GR means Graduate student.

UG means Undergraduate student

NOTE: Please place your poster to the number allocated. In this book the posters are listed in alphabetic order. During the conference sessions, they will be NOT organized in alphabetic order but by discipline. Such organization helps to make easier the judging effort.

The McNair, SURF, Welch, and other sponsorship programs are indicated

Presenter: **Kayode Adeoye** [$]
Major: Chemistry and Biochemistry
Email: kadeoye@lamar.edu
Mentor: Dr. Paul Bernazzani [$]
[$] Department of Chemistry and Biochemistry, Lamar University

Poster_1 / GR-S / In progress
Welch project

Investigating the Potential of an Amylose/Pectin Composite for Organic Contaminants Remediation.

The environmental impact of pollutants such as heavy metals, organic dyes, and industrial waste has prompted the development of advanced materials capable of detecting and removing contaminants efficiently. Biopolymer-based composites of polysaccharides have been shown to bind to heavy metals and could offer a sustainable method for the remediation of organic contaminants. In this study we explore the potential of a composite material composed of amylose, a linear polysaccharide derived from starch, and pectin, a Herero polysaccharide found in plant cell walls, for the adsorption of environmental organic contaminants. This study investigated the thermal stability of amylose and pectin polymers, crucial components in plant-based materials, using (DSC).

Presenter: **Temitope Haleemat Adisa** [$]
Major: Chemistry and Biochemistry
Email: tadisa@lamar.edu
Mentor: Dr. Paul Bernazzani [$]
[$] Department of Chemistry and Biochemistry, Lamar University

Poster_2 / GR-S / Early phase
Welch project

Investigating the Addition of Nanoparticles to the Melting Temperature of PEEK.

Next generation semi-conductors will require novel packaging materials with high temperature resistance. Polyether ether ketone (PEEK) is a high-performance thermoplastic known for its excellent thermal stability, making it a good starting material, however, enhancing its thermal resistivity is essential for expanding its application in high-temperature environments. This study investigates the effect of incorporating titanium dioxide (TiO2) nanoparticles on the thermal behavior of PEEK. A series of PEEK/TiO_2 composite films were prepared by dissolving PEEK in concentrated sulfuric acid and mixing with TiO2 dispersed in methanol. The thermal properties of the composites were evaluated using differential scanning calorimetry (DSC). Results indicate that the addition of TiO2 nanoparticles significantly increases the melting temperature and thermal stability of PEEK, making the composite material more suitable for high-temperature applications.

Presenter: **Shanzidul Ahmed** [$]
Major: Mechanical Engineering
Email: sahmed20@lamar.edu
Mentor: Dr. Xianchang Li [$]
[$] Department of Mechanical Engineering, Lamar University

Poster_5 / GR-S / Early phase
Master project

A Numerical Analysis of Engine Characteristics with Biodiesel.

Transportation sector is developing day by day, with the increasing number of populations. Still now it is much more dependent on petroleum-based fuels which are derived from non-renewable crude oil reserves. The extraction of this fuel is troublesome and costly which makes if more demanding and the price is increasing as well. Besides this, this source of energy is also depleting on an alarming rate that it has become a concern for the world. Moreover, excessive consumption of petroleum-based fuel has serious consequences on climate change as it is one of the contributors to GHG (Green House Gas) emissions. By keeping in mind these issues, it is now claimed that biodiesel can be a powerful source of energy which can replace the conventional fuels in transportation sector which has also the potential in mitigating carbon emissions. The aim of this study is to focus on performance and emission characteristics of diesel engine with biofuel blended with diesel. This numerical study will add a new dimension of research for the potential candidate of conventional diesel fuel.

Presenter: **Hannah Albarran** [$]
Majors: Neuroscience, Psychology
Email: hannahca333@gmail.com
Mentor: Dr. Llyod Lumata [$,#,%]
[$] Department of Physics, University of Texas at Dallas, Richardson
[#] Department of Bioengineering, University of Texas at Dallas, Richardson
[%] Department of Neuroscience, University of Texas at Dallas, Richardson

Poster_20 / UG-S / In progress
Independent research

13C NMR Spectroscopic Analysis of Glycolytic and TCA Cycle Dysregulation in Cancer Cells.

Glycolysis and the tricarboxylic acid (TCA) cycle are crucial metabolic pathways responsible for energy production, biosynthesis, and maintaining cellular redox balance. Glycolysis occurs in the cytoplasm and is vital for generating energy and metabolic intermediates. The TCA cycle, localized in the mitochondria of eukaryotic cells, facilitates nutrient-derived energy extraction and provides intermediates for biosynthesis. In cancer, these metabolic pathways are often disrupted, with glycolysis becoming dysregulated and TCA cycle function impaired. In this study, nuclear magnetic resonance (NMR) spectroscopy was employed to investigate lactate production from glycolysis in Caki-1 and 786-O renal cancer cell lines, and SK-N-SH neuroblastoma cell line, using [1,2-13C] glucose, as well as TCA cycle dynamics using [1,4-13C] aspartic acid. Lactate production was found in both Caki-1 and 786-O cell lines with [1,2-13C] glucose, but none in either cell line with [1,4-13C] aspartic acid. Preliminary results for SK-N-SH cell line will be presented here.

Presenter: **Rishi Bharadwaj** [$]
Major: Electrical and Computer Engineering
Email: rbharadwaj@lamar.edu
Mentor: Dr. Cristian Bahrim [#, $]
[$] Department of Phillip Drayer Department of Electrical and Computer Engineering, Lamar University
[#] Department of Physics, Lamar University

Poster_24 / GR-S / Advanced Doctoral project

Retention of Radiation on a Reflective Glass Surface.

The interaction between two cw-TEM00 laser beams assisted by a capacitor voltage which is set across a silica-glass surface allows us to finely adjust the vibrational frequencies of the surface dipoles. We use low voltages (< 5.3V) for having a linear optical response from the silica glass irradiated with a weak 532 nm probe laser in its transparency window. This background of isotropic energy shifts the frequency of the surface dipoles by a few eV/h. To further modify the interaction of the probe alone with the surface dipoles, a much brighter coupler is oriented at normal incidence on the glass. We use a polarization configuration of the two lasers that favors the coupling between the two lasers. The surface dipoles align along the resultant electric field of the two laser beams and act as a diffraction grating for the reflected light. For data processing, in the first step we calibrate and normalize the parallel reflectance to the plane of incidence using a numerical code in MATLAB and next, we reduce the reflectance's error bar using a graphical method based on the removing of outliers created by random experimental causes. Thus, we manage to reduce the error bar to lesser than 0.5% without altering the reflectance's value and reach a precision for our experimental signal that allows an accurate interpretation of the interference pattern between the two laser beams observed in the parallel component of the reflectance by using our modified diffraction grating theory.

Presenter: **Mitchell B Fountain** [$]
Major: Mechanical Engineering
Email: mfountain4@lamar.edu
Mentor: Dr. Liv Haselbach [#]
Co-author: Hossein Hariri Asli [#]
[$] Department of Mechanical Engineering, Lamar University
[#] Department of Civil and Environmental Engineering, Lamar University

Poster_6 / GR-S / Early phase Center for Resiliency project

Preliminary Study of Temperature Variations within Pervious Concrete-Aggregate Systems.

The urban heat island effect (UHI) is a phenomenon in which cities or other highly urbanized areas experience higher overall ambient temperatures as compared to rural areas. This is primarily due to the large amount of structural materials present in urban areas which have a greater capacity to store thermal energy as compared to vegetation. Pervious concrete (PC)-aggregate systems are well known for their stormwater management properties, but further research into their impact on UHI is needed to see what positive or negative environmental impacts it may have in urban centers. For this study, temperature data from two PC-aggregate systems (with different site characteristics) on or near the Lamar University campus in Beaumont, Texas, are being analyzed to better understand what drives the temperature variations in

these systems. Analyzing this temperature data is an important first step in determining what impact these systems may have on UHI.

Presenter: **Jakub Formella** [$,#]
Major: Neuroscience
Email: jaf210005@utdallas.edu
Mentor: Dr. Llyod Lumata [$,#,%]
[$] Department of Physics, University of Texas at Dallas, Richardson
[#] Department of Bioengineering, University of Texas at Dallas, Richardson
[%]Department of Neuroscience, University of Texas at Dallas, Richardson

Poster_21 / UG-S / In progress
Welch & DoD project

Utilizing 13C NMR Spectroscopy to Investigate Krebs Cycle Dynamics with [2-13C] D-Glucose in Glioblastoma Cell Lines U87 and LN18.

The Krebs cycle, a central metabolic pathway in mitochondria, oxidizes acetyl-CoA derived from carbohydrates, fats, and proteins to produce NADH and FADH2. These molecules carry high-energy electrons to the electron transport chain, where they drive the synthesis of ATP through oxidative phosphorylation. This study explores the dynamics of the Krebs cycle in glioblastoma cells by using [2-13C] D-Glucose as a metabolic tracer in two glioblastoma cell lines, U87 and LN18. The cells were cultured in glucose-enriched media until reaching sufficient density, and then seeded in regular media for 24 hours. Subsequently, one set of flasks was incubated for 48 hours in media containing [2-13C] D-Glucose, this was the experimental condition. While the other set was maintained in regular media for 47 hours and exposed to [2-13C] D-Glucose for the final hour as the control condition. Both cells and media were collected and analyzed using 13C NMR spectroscopy to probe the metabolic fluxes of the Krebs cycle, providing detailed information into altered metabolic pathways in glioblastoma. The results of the experimental condition show expected lactate production; however, the control condition showed an increased presence of downstream Krebs cycle metabolites. This could indicate glioblastoma's preference to utilize glucose for metabolites produced by the Krebs Cycle, even with available glutamine for reductive carboxylation.

Acknowledgement: This study was supported by the Welch Foundation grant AT-2111-20220331 and the US Department of Defense CDMRP grants W81XWH-19-1-0741, W81XWH-21-1-0176, W81XWH-22-1-0105, W81XWH-22-1-0003, HT9425-23-1-0062, and HT9425-24-1-0287.

Presenter: **Ramya Gollamudi** [$]
Major: Chemistry and Biochemistry
Email: rgollamudi@lamar.edu
Mentor: Dr. Sylvestre Twagirayezu [$]
[$] Department of Chemistry and Biochemistry, Lamar University

Poster_3 / UG-S / In progress
Master project

Perfluorooctanoic Acid Monohydrate (PFOA-H_2O) Studied by Molecular Rotational Resonance (MRR) Spectroscopy.

As a part of efforts to determine the utility of MRR spectroscopy as a novel tool for fast detection of PFOA in environmental samples, a Bright Spec broadband MRR spectrometer, which operates in 2-8GHz, has been employed to record the rotational spectrum of perfluorooctanoic acid monohydrate (PFOA-H2O). The observed spectrum shows well-resolved rotational patterns due to MRR's sensitivity to conformational changes. With the aid of quantum chemistry calculation, one conformer has been assigned by adding each measured rotational to the fit one by one until all three rotational constants (A, B, C) are well determined. The final fits have been performed using Pickett's SPFIT Suite. Additionally, the validity of PFOA-H2O as a prolate symmetric molecule has been evaluated. The work to assign other conformers is underway and will be reported in the future.

Presenter: **Md Rashedul Islam** [$]
Major: Mechanical Engineering
Email: mislam23@lamar.edu
Mentors: Dr. Xianchang Li [$] and Dr. Jenny Zhou [$]
[$] Department of Mechanical Engineering, Lamar University

Poster_10 / GR-S / In progress
Master project

Stress Analysis of Piping with Expansion Loops by Using Finite Element Method.

The primary means of transporting fluids across an industrial facility is through piping systems. The stresses caused by the operating fluid's heat effects have a significant impact on the design and routing of pipes. Long pipes that are subjected to large temperature variations frequently experience substantial thermal stress and thus displacement. To allow for thermal expansion and contraction and avoid undue strain and possible failure, an expansion loop is an essential part of piping systems. The negative impact is that expansion loops require extra supports, elbows, bends, and associated structures, and thus more room. To ensure the system's integrity and safety, it is critical to assess the stresses and deformation of the piping system under thermal loads.

By using the ANSYS workbench, a finite element analysis is conducted in this study to examine the displacement and stress distribution along a pipe with different types of expansion loops. By varying the loop length, width, bend radius, and number of loops, the maximum stress as well as its location can be identified and formulated. For example, for a specific length and width of an expansion loop, the maximum stress becomes lower when multiple loops are adopted. The maximum stress can also be reduced when the loop length increases while the other parameters remain the same. This study can help acquire the optimal design within a certain safety factor.

Presenter: **Mengjie He** [$]
Major: Industrial and Systems Engineering
Email: mhe@lamar.edu
Mentor: Dr. Xinyu Liu [$]
Co-authors: Qin Qian [#], and Jing Zhang [%]
[$] Department of Industrial and Systems Engineering, Lamar University
[#] Department of Civil and Environmental Engineering, Lamar University

Poster_12 / GR-S / Advanced
Doctoral project

[%] Department of Computer Science, Lamar University

Dissolved Oxygen Prediction Using Long Short-Term Memory-Based Deep Learning Models with Recurrent Transfer Learning.

Simultaneous extreme climatic events, e.g., flooding/heat, droughts/heat, are potentially capable of destabilizing hydro-meteorological conditions to deteriorate river water quality. Machine learning (ML) models utilizing wireless sensor measurements have been applied to predict dissolved oxygen (DO) in various water management systems. This study aims to develop DO models based on Long Short-Term Memory (LSTM) to facilitate decision-making in water supply management. Hourly measurements of DO, water temperature, sample depth, conductivity, pH, turbidity, and discharge, are adopted for model development at the Pine Island Bayou C749 station and Neches River Saltwater Barrier. LSTM and Bi-direction LSTM (BiLSTM) with and without Attention mechanism (AT) are selected to develop DO models. Recurrent transfer learning (RTL) is utilized to overcome the insufficient data at the Saltwater Barrier. Moreover, Integrated Gradients (IG) algorithm is applied to analyze feature importance. The AT-BiLSTM and RTL-LSTM models achieved the best performance at the station C749 (RMSE=0.054) and Saltwater Barrier (RMSE=0.028), respectively. Meanwhile, DO, temperature, and pH were identified as the important features, consistent with the physical model. Furthermore, the best model was employed to conduct 14-day DO estimations at the station C749 through the rolling forecast procedure under drought and flooding events for practical applications. The forecasts revealed the obvious decline in DO levels under high temperatures during drought events, and the possible hypoxia after the flood peak due to increasing temperatures and nonpoint sources carried by the floodwater. In conclusion, LSTM-based models are recommended as an alternative tool to monitor water quality to provide information for water management.

Keywords: Dissolved Oxygen (DO), Wireless Sensor, Deep Learning, Long Short-Term Memory (LSTM), Attention Mechanism (AT), Recurrent Transfer Learning (RTL), Flood/Drought Events.

Presenter: **Jiya Khatri** [$]
Email: jiyakhatri10@gmail.com
Major: Cognitive Science
Mentor: Dr. Llyod Lumata [$,#,%]
[$] Department of Physics, University of Texas at Dallas, Richardson
[#] Department of Bioengineering, University of Texas at Dallas, Richardson
[%]Department of Neuroscience, University of Texas at Dallas, Richardson

Poster_22 / UG-S / In progress
Independent project

NMR Analysis of Lactate Production via Alanine Metabolism in Pancreatic Ductal Adenocarcinoma Cells.

Pancreatic ductal adenocarcinoma (PDAC) is a type of pancreatic cancer with a high recurrence rate due to its aggressive nature and resistance to treatments. MIA-paCa-2 cells, derived from human PDAC, are used to investigate metabolic changes in pancreatic cancer cells. Glucose is the primary substrate driving cancer cell proliferation. Specifically, glucose rapidly produces pyruvate through glycolysis, which is then converted to lactate through Lactate Dehydrogenase. However, studies suggest that in the absence of glucose, alanine may contribute to the pyruvate pools and lactate production. The mechanism uses Alanine Transaminase and transfers an amino group from alanine to α-ketoglutarate, resulting in pyruvate

and glutamate. Although MIA PaCa-2 cells are in a glycolytic environment, alanine can contribute to the acidic tumor microenvironment. This study utilized [1-13C] Alanine and Nuclear Magnetic Resonance Spectroscopy to investigate and track alanine metabolism in MIA-paCa-2 cells for 48 hrs in the absence of glucose. We hypothesized that alanine will serve as an auxiliary energy source to the production of lactate in certain conditions, although it is significantly less compared to the use of glucose. Understanding the altered metabolic states of cancer cells, which could inform future therapeutic strategies by targeting cancer-specific metabolic pathways. The results of this study will be presented and discussed.

Acknowledgement: This study was supported by the Welch Foundation grant AT-2111-20220331 and the US Department of Defense CDMRP grants W81XWH-19-1-0741, W81XWH-21-1-0176, W81XWH-22-1-0105, W81XWH-22-1-0003, HT9425-23-1-0062, and HT9425-24-1-0287.

Presenter: **Rasmila Lama** [$]
Major: Management Information Systems
Email: rlama@lamar.edu
Mentor: Dr. Jing Zhang [#]
Co-author: **Birbal Tamang** [#]
[$] Department of Information Systems, Lamar University
[#] Department of Computer Science, Lamar University

Poster_11 / GR-S / In progress
Master project

Mixed Reality Flood Simulation and Analysis at Lamar University.

Flooding is a critical issue affecting the Southeast Texas area. Mixed Reality (MR), an emerging technology that integrates computer-generated sensory inputs into real-world surroundings to create immersive and interactive environments, can serve as a powerful tool for predicting and simulating potential floods in support of flood management and resiliency analysis. This project utilizes Microsoft HoloLens 2 to create an MR experience that simulates flooding scenarios on the Lamar University campus. Through a 3D map from Google Earth, users can interact with flood conditions ranging from light rain to heavy downpours. The MR platform provides real-time flood simulations, featuring red markers to identify flood-prone areas and wave animations to depict rising water levels as rain intensity increases. It also includes a simulation of Hurricane Harvey (which occurred on August 29, 2017, and lasted approximately five days), using datasets from the Civil & Environmental Engineering department at Lamar University.

This research demonstrates the potential of MR technology to enhance flood risk visualization, making it an invaluable tool for flood management and resiliency-focused research, teaching, and outreach. The MR platform allows researchers to gain deeper insights into flood scenarios, offers students an interactive and immersive learning experience, and raises awareness about flood resiliency through various Lamar University events, such as Cardinal View for prospective students, new student orientation, and summer camps for local K-12 students.

Presenter: **Anusha Shahzeb Meghani** [$]
Major: Chemistry
Email: ameghani2@lamar.edu
Mentor: Dr T. Thuy Minh Nguyen [$]

Poster_18 / GR-S / In progress
Welch research

[$] Department of Chemistry and Biochemistry, Lamar University

Zinc Oxide Nanoparticles Impede Reduce the Biosynthetic Production of Ergosterol in *Candida albicans*.

Candida albicans is a pathogenic organism that is found in the gastrointestinal tract and mouth of about half of the healthy adult population. Under certain circumstances, it can become pathogenic leasing to the development of antifungal drugs. These drugs target the ergosterol biosynthetic pathway, but drug resistance is becoming a problem. Our goal is to seek to understand this pathway better to establish different drug target. Candida a. cells were grown in the presence of ZnO nanoparticles, a known sterol pathway inhibitor, and the lipid composition of the cells was evaluated using gas chromatography. Results show at a minimum concentration of ZnO, a significant change in the sterol composition occurs.

Presenter: **Olatunji Ogunjobi** [$]
Major: Chemistry
Email: oogunjobi@lamar.edu
Mentor: Dr. Paul Bernazzani [$]
Co-author: Dr T. Thuy Minh Nguyen [$]
[$] Department of Chemistry and Biochemistry, Lamar University

Poster_19 / GR-S / In progress
Welch project

Blending Biocompatible Polymers for Potential Biomedical Applications.

Polylactic acid (PLA) and its copolymers have been safely used in an extensive range of applications including packaging, textiles, and biomedical devices. PLA is biocompatible, biodegradable by hydrolysis and enzymatic activity, and has a large range of mechanical and physical properties that can be engineered appropriately to suit multiple applications. On the other hand, Polyethylene glycol (PEG) is a versatile, hydrophilic polymer widely used in pharmaceuticals, cosmetics, and industrial applications. A combination of PLA and PEG could have significant advantages. Films of PLA, PEG, and their mixtures were prepared from solutions in chloroform. Blends were evaluated using FTIR spectroscopy and changes in thermodynamic properties were followed using differential scanning calorimetry. Results show that stable blends were produced.

Presenter: **Yuyi Pei** [$]
Major: Mechanical Engineering
Email: ypei@lamar.edu
Mentor: Dr. Qin Qian [#]
Co-author: Dr. Xianchang Li [$]
[$] Department of Mechanical Engineering, Lamar University
[#] Department of Civil and Environmental Engineering, Lamar University

Poster_7 / GR-S / In progress
Center for Resiliency project

Modeling Climate Change Impacts on Southeast Texas Coast waterbodies.

With the increasing frequency of disasters, Southeast Texas coastal regions are prone to higher risk of heat, freeze, flooding, and storm surges than before. Intensified land erosion by waves currents during events

of flooding and storm surges and water temperature change under extreme hot and freeze conditions due to climate changes had emerged. To understand the impacts of climate change, a 3D hydrodynamic model using Environmental Fluid Dynamics Code Plus (EFDC+) was developed including the Sabine Lake and its two major inflows – Neches River and Sabine River using the updated 1-meter resolution Lidar data with bathymetric sonar data developed by United States Interagency Elevation Inventory. The boundary and initial condition data were collected from USGS, NOAA, TCEQ, and NWS. The model calculated the time series of flow vectors and temperatures to demonstrate the hydrodynamics and a warming process due to dry and extra heat conditions. The flow vector responded to the wind speed and direction and strong wind action pushed the water to cause erosion along the shoreline of the Sabine River. The results showed that the hydrodynamics and water temperature are impacted by the meteorological data, wind and tide conditions, flows from the interconnect waterbodies. In summary, this study provides useful outputs may be used for understanding the flow characters and temperature profile of the Sabine Lake, gives a possibility of a fundamental knowledge for more complex hydrodynamic and water quality modeling to unveil the impact of hydrology and meteorology variability in the future climate conditions.

Presenter: **Robert Reinartz** [$]
Major: Mathematics
Email: reinartzr1@gator.udh.edu
Mentor: Dr. Katarina Jegdic [$]
Co-authors: Christina Hamilton [$], Justin Cline [$], and **Jabari Fowler** [$]
[$] Scholar's Academy, University of Houston – Downtown

Poster_13 / UG-S / In progress
Independent project

Using Artificial Neural Network Models to Understand and Predict Baseball.

Major League Baseball (MLB) is one of America's largest sports and is uniquely suited for data-driven analysis and prediction due to the volume of games and data collected (around 7 TB per team per game). This vast dataset provides ample independent variables for research and is accessible to the public, enabling a range of applications from gambling and fantasy leagues to team scouting.

Given baseball's discrete, quantifiable nature, it is ideal for statistical analysis and serves as an effective training ground for machine learning models, including Artificial Neural Networks (ANNs). In this study, we use variables such as release position, spin axis, release velocity, and acceleration to predict pitch location as our dependent variable. This initial model lays the groundwork for a more complex ANN, wherein the predicted pitch location will serve as an independent variable in a larger network. The ultimate goal is to predict whether a batter will reach base by building a multi-node neural network model with hidden layers, leveraging pitch location as an influential factor.

This research highlights the potential of artificial intelligence in sports analytics, with applications that may enhance team strategies and player performance evaluations.

Keywords: Logistic Regression, Predictive Modeling, Classification, Sports Analytics.

Presenter: **Emily Ross** [$]
Major: Chemistry
Email: eross4@lamar.edu
Mentor: Dr. T. Thuy Minh Nguyen [$]

Poster_17 / GR-S / In progress
Welch project

[$] Department of Chemistry and Biochemistry, Lamar University

Study of the Effects of Zinc Oxide Nanoparticles on *Candida parapsilosis* Cellular Growth.

The pathogenic yeast *Candida parapsilosis* is well known to cause infections in hospital settings. A key issue of this fungi is a growing ability to develop resistance to antifungal agents. This resistance may be associated with the fast exportation of drugs through the efficient activity of efflux pumps. ZnO nanoparticles have shown promise to affect this pump. The goal of this project is to demonstrate that ZnO can affect the cell growth of *Candida p.* by causing permanent DNA damage. Cells were grown in the presence of different amounts of ZnO nanoparticles, and studied using optical density, FTIR spectroscopy, and agarose gel electrophoresis. Results demonstrate changes in cells as the quantity of nanoparticles is increased.

Presenter: **Roseline Sogbuyi** [$]
Major: Civil Engineering
Email: rsogbuyi@lamar.edu
Mentor: Dr. Liv Haselbach [$]
Co-author: **Mitchell B Fountain** [#]
[$] Department of Civil and Environmental Engineering, Lamar University
[#] Department of Mechanical Engineering, Lamar University

Poster_8 / GR-S / Early phase
Center for Resiliency project

Preliminary Study of Vibrations in Rainfall Distribution in Southeast Texas.

Variation in rainfall data over a small-gaged area is a subject of interest to hydrology works and spatial analysis. Variations could be a result of various factors such as topography, vegetation, proximity to water bodies, wind direction, seasonal changes or urbanization. Sometimes, it could be as a result of a gage calibration. In this research, daily rainfall accumulation data between January and September 2024 were obtained and compared from two Low-Cost Flood Sensors (LU01 & LU02) within Lamar University which are less than a mile apart. To confirm the accuracy of the rain data obtained from each rain gage, the data will be compared with data from a weather station nearby (less than a mile) and other rain gage stations belonging to Lamar University. Variations during individual daily events and over the 9 months periods were observed. It was observed that LU03 experienced more rainfall than LU02. Further research will include possible causes of the variations and likely effects of such variations. The variations will be useful in understanding the advantages, limitations and usability of the Low-Cost Flood Sensors and the accuracy of the rain data in modeling watersheds.

Presenter: **Christopher St. Julian** [$]
Major: Physics
Email: cstjulian@lamar.edu
Mentor: **Dr. Bogdana Bahrim**
[$] Department of Physics, Lamar University

Poster_23 / UG-S / In progress
TEAM-UP project

Charge Transfer During H- Collisions With Au(111) Surfaces.

The H- ion survival probability after scattering from Au(111) surfaces, is investigated for various incident projectile energies and exit angles, by using a Wave Packet Propagation approach. The ion survival probability exhibits a peak at low exit angles, followed by a broader structure at high exit angles. The peak is attributed to the H- projectile experiencing the Au(111) band gap effect, while the broad structure at higher angles is attributed to electron recapture processes that may occur during the outgoing projectile trajectory. The band gap effect needs time to become fully operational, as it can be seen from the behavior of the ion survival probability versus time, for several incoming energies. Therefore, it significantly affects the ion-surface charge transfer at lower collision velocities, and eventually lower exit angles, when the projectile spends more time in the vicinity of the surface. This research has a broad range of applications in various applied fields such as: Space Science, Aeronautics and Engineering, Plasma-Wall Interactions, and Ion Collisions.

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Presenter: **Victoria Taylor** [$]
Major: Undeclared
Email: vicrain1603@gmail.com
Mentor: Dr. Lauren Richardson [$]
Co-authors: Briana Ortiz [#], Ashley Driscoll [#], Sungjin Kim [%], Po Yi Pam [%], Arum Han [%] and Ramkumar Menon [#]
[$] Wellborn Middle School, College Station
[#] Department of Obstetrics & Gynecology, Division of Basic Science and Translational Research, The University of Texas Medical Branch at Galveston
[%] Department of Electrical and Computer Engineering, Department of Biomedical Engineering, Texas A&M University, College Station

Poster_15 / STEM / Early phase Independent research

Novel Organ-On-Chip Devices for Modeling Reproduction and Pregnancy-Related Organ.

Introduction: Drug testing in obstetrics is challenging as two patients, mother and fetus, must be evaluated. Animal models structurally nor functionally mimic human tissue contributing to these discrepancies. To overcome these limitations, we have developed six organ-on-chips (OOC) that represent the structure, functions, and responses of various human intrauterine organs.
Methods: OOCs were fabricated in poly(dimethylsiloxane) (PDMS) with two-step photolithography and soft lithography. PDMS chambers were plasma bonded to glass to make them hydrophilic. Devices contained an on-chip reservoir generated by acrylic milling for long-term media storage. Reservoirs were aligned on top of inlets/outlets of chambers and bonded. Human-derived primary cells were isolated, immortalized, and utilized within each respective OOC system.
Results: The Fetal membrane-OOC contains four cell chambers filled with decidua, chorion trophoblasts, and amnion cells connected by arrays of microchannels. The placenta-OOC is comprised of three rectangular chambers containing syncytiotrophoblasts, cytotrophoblasts, and umbilical cord endothelial cells connected by horizontal microchannels. Fetal membrane-placenta-feto-maternal interface-OOC combines both chips into one device biomimicing all cellular and collagen layers. The second-trimester placenta villous-OOC contains six representatives maternal (vessel/decidua) and fetal (trophoblasts/stroma/vessel) cell chambers. The vaginal-cervix-decidua-OOC is composed of six cell

chambers (vaginal epithelium, cervix epithelium/stroma, decidua) to mimic the lower female uterine tract. Additionally, a two-chamber-OOC can be used to study segments of these interfaces.

Conclusion: These OOC platforms can be used as novel tools to study physiological and pathological pregnancy conditions, conduct preclinical trials, and conduct toxicology screening. These advances also minimize the need for animal model testing in obstetrics research.

Presenter: **Kaitlyn Timmons** [$]
Major: Medical degree
Email: katimmon@utmb.edu
Mentor: Dr. Lauren Richardson [#]
Co-authors: Souvik Paul [#] , Rheanna Urrabaz-Garza [#] , Jeena Jacob [#] , Pilar Flores [#] Ananth Kammala [#] and Ramkumar Menon [#]
[$]John Sealy School of Medicine, The University of Texas Medical Branch at Galveston
[#] Division of Basic Science and Translational Research, Department of Obstetrics and Gynecology, The University of Texas Medical Branch at Galveston

Poster_14 / GR-S / Advanced Medical research

Exosomal Interleukin-10 (eIL-10), a Novel Anti-Inflammatory Therapeutic for Preterm Birth: Evaluation of Cell-Secreted Metabolites at the Placenta and Fetal Membrane Fetal-Maternal Interfaces.

Background/Introduction: Inflammatory pathways are implicated in parturition signals at the fetal-maternal interface (FMi) preceding preterm labor. Exosomal IL-10 (eIL-10), a novel therapeutic designed to target these pathways and delay preterm parturition, has shown success in reducing preterm delivery in mice models. Little is known, however, about its effects on human FMi local metabolism. In this project, an organ-on-chip (OOC) biomimicking both FMis (placenta/fetal membranes) was utilized to assess eIL-10-induced secreted metabolic changes.

Methods: OOCs were loaded with maternal (decidua), placental (trophoblasts-endothelial), and membrane (chorioamnion) cell and collagen layers. PKH26-eIL-10 treatment was added to the decidua, and live cell imaging documented maternal-to-fetal exosome propagation. After 3 days, media was collected from each layer and processed for untargeted mass spectrometry. Devices without eIL-10 were used as a control. Top abundant compounds, along with differently produced compounds between control vs. eIL-10 devices, were evaluated and assigned to their most implicated metabolic pathways and cellular localizations.

Results: Cell layer-specific metabolites were identified; however, most abundant compounds were similar across treatment groups. Across maternal and fetal layers, eIL-10 treatment upregulated compounds were classified in glutathione, fatty and salicylic acid, and various subtypes of amino acid metabolism and found to exhibit anti-inflammatory functions (traumatic acid, 9-oxononanoic acid, and tyrosol) compared to controls. Treatment also downregulated inflammatory pathway-associated compounds, e.g.arachidonic acid and inflammatory neuroactive peptide metabolism.

Conclusion: eIL-10 has been shown to reduce maternal inflammation and delay preterm birth in mice. Here, we augment these pre-clinical studies by documenting eIL-10s' ability to cross both FMis and induce cellular level anti-inflammatory metabolic changes.

Presenter: **Golnoosh Toosi** [$]
Major: Civil and Environmental Engineering

Poster_9 / UG-S / In progress Master project

Email: gtoosi@lamar.edu
Mentor: Dr. Xing Wu [$]
Co-authors: Minhajul Abedin Tajik [$], and Dr. Victor A. Zaloom [#]
[$] Department of Civil and Environmental Engineering, Lamar University
[#] Department of Industrial Engineering, Lamar University

Study of Ships' Travel Delay in Staying Turning Basins in Deep-draft Inland Waterways: Application to Sabine-Neches Waterway.

The turning basin in a deep-draft inland waterway provides the space for big ships to stay and wait (e.g., for taking bunker) when heading in a narrow channel if its actual destination docks are not available. Such stay and wait causes some serious delay. In this study, we aim to investigate the travel patterns of such stay and wait in these turning basins, and investigate the delay associated with such travel patterns with the AIS data. In this study, we employed the AIS data collected from May 1st to July 15th of 2022 in the Sabine-Neches Waterway (SNWW), a vital maritime route serving Southeast Texas with several turning basins. To maintain safe and efficient water transportation, it becomes imperative to deepen the waterways, especially considering the growing demands of local energy industries and ports. The study develops a comprehensive methodological framework to identify ships' travel patterns if they have to stay and wait in these turning basins, and then to estimate the travel delay associated with such stays and waits. All AIS data were analyzed based on a PostgreSQL database with a GIS package. The implementation shows the effectiveness of the proposed methods, and the revealed travel patterns and the delay helps the waterway management authority better understand the effectiveness of the channel, and it can also help them better arrange the traffic of ships in the channel to reduce the travel delay. The proposed methods can be also applied to other inland waterways with turning basins.

Keywords: waterway transportation, delay, turning basin, AIS data.

Presenter: **Celeste Traub** [$]
Major: Medical degree
Email: cwtraub@utmb.edu
Mentor: **Dr. Ananth Kumar Kammala** [$]
**Co-authors: Sierra Wood [$], Richa Hoy [$], Batul Shakir [$],** Lauren Richardson [$], and Ramkumar Menon [$] (*Equal contribution of authors*)
[$] Division of Basic Science and Translational Research, Department of Obstetrics and Gynecology, The University of Texas Medical Branch at Galveston

Poster_16 / GR-S / Early phase Independent research

In-Silico Evaluation of FDA-Approved Compounds for Safe Use in Pregnancy: Targeting Preterm Birth Prevention.

Background/Introduction: Pregnant women are often excluded from clinical trials, leaving a significant gap in safety data for many FDA-approved drugs. This knowledge gap poses risks due to unclear drug effects on both mother and fetus. This study aims to evaluate the safety and pharmacokinetics of FDA-approved drugs, focusing on those that may reduce inflammation and prevent preterm birth (PTB)..
Objectives: To apply a computational approach to assess the safety of various classes of FDA-approved drugs for use during pregnancy by evaluating their absorption, distribution, metabolism, excretion (ADME), and toxicity profiles, identifying compounds with favorable maternal-fetal interactions.

Methods: A screening of 3,113 compounds from the FDA-approved drug library (Selleckchem.com) was conducted using ADMET LAB 2.0 for pharmacokinetics and ProTox 3.0 for toxicity. Drugs were grouped by mechanism of action, including anti-infectives, H1-antagonists, 5-HT receptor agonists, adrenergic receptor agonists, COX inhibitors, and anti-epileptic agents. Compounds were assessed based on gastrointestinal absorption, organ toxicity, neurotoxicity, respiratory toxicity, cardiotoxicity, and mutagenicity, filtering those with anti-inflammatory potential and low toxicity.
Results: Of the 3,113 compounds, 1,320 had high absorption. Following toxicity screening, 50 compounds with favorable ADME and toxicity profiles remained. The top drug classes included 5-HT receptor agonists, adrenergic receptor agonists, anti-infectives, and COX inhibitors, showing minimal toxicity and potential anti-inflammatory effects.
Conclusion: This study demonstrates the utility of computational methods in assessing FDA-approved drug safety during pregnancy. By identifying compounds with minimal toxicity and beneficial anti-inflammatory effects, this research lays the foundation for future in-silico studies to refine drug selection for managing preterm birth and its associated complications.

Presenter: **Nimra Usman** [$]
Major: Chemical Engineering
Email: nusman@lamar.edu
Mentor: Dr. Daniel Chen [$]
Co-author: Dr. Phil Cole [#]
[$] Dan F. Smith Department of Chemical and Biomolecular Engineering, Lamar University
[#] Department of Physics, Lamar University

Poster_4 / GR-S / In-progress
Center for Resiliency project

CFD Modeling of Methane Gas Release from an underground pipeline.

Subterranean pipelines are crucial for transporting natural gas and light hydrocarbons globally, but these pipelines carry the risk of ruptures that can release hazardous materials, leading to severe financial and human consequences. Effective consequence modeling necessitates a deep understanding of gas flow dynamics and its atmospheric escape to develop robust preventive and mitigation strategies. This research focuses on developing a computational fluid dynamics model in ANSYS Fluent to simulate the flow of gas from ruptured subterranean pipelines, addressing the critical need for better safety measures. By integrating advanced modeling techniques in ANSYS Workbench, the study aims to predict gas flow regimes such as diffusion, fluidization, and crater formation under various conditions. The model will be validated with experimental work conducted by Yan et al. and assessed for its ability to predict methane concentrations and flow behaviors. This work provides a valuable tool for understanding and mitigating the risks of underground pipeline breaches.

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