Claflin University Biomedical/Biomaterials Research Summer Internship Program (BR-SIP)

Research Symposium

July 13, 2018

Molecular Science Research Center
898 Goff St.
Orangeburg, SC 29115

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Claflin Staff: Stephon Void, Connie Palmer, Carolyn Sherman, Sonya Goodwin, Maria Simmons, Merilyn Palmer, Tekiah McClary, Pamela Shuler

Arianna Bowers

High School: Bamberg-Ehrhardt High School, Bamberg SC

Research Title: ***Isolation of Soil Bacteria That Produce Antibiotics***

Mentor: Dr. Randall Harris

(INBRE Target Faculty)

Department: Biology

Abstract:

Antibiotics are used to treat bacterial infections. However, the bacteria have the ability to become resistant to the antibiotic. One reason for this is doctors are over prescribing antibiotics. There is a major need for new antibiotics that won't allow the bacteria to become resistant. The purpose of this research is to see if bacteria from the soil will produce an antibiotic that will cure bacterial infections. We performed an antibiogram to see if the antibiotics produced would create a zone of inhibition when combining the soil bacteria with different test bacteria. One of the nine soil bacteria produced an antibiotic against Micrococcus luteus. Performing this research experiment is the first step to decreasing the number of antibiotic resistant deaths and diseases.

Alyna Brown

High School: Swansea High School, Columbia SC

Research Title: ***Understanding Molecular Structure and Properties using Computational Chemistry Software***

Mentor: Dr. Bijoy Dey

(INBRE Target Faculty)

Department: Chemistry

Abstract:

The purpose of the "Modeling of Molecules" experiment was to understand different properties of molecules. The focus was on Gaussview Mathcad types of molecules relevant to the Ammonia molecule.

Aariana Darby

High School: Brookland Cayce High School, Columbia SC

Research Title: ***Controlled Potential Electrochemistry***

Mentor: Dr. Uruthira Kalapathy

Department: Chemistry

Abstract:

Electrochemistry involves the use of redox reactions to generate electrical energy or uses electrical energy to perform redox reactions. In this project, electrical energy in the form of controlled potential, is used to perform a Fe(II)/Fe(III) redox reaction. Fenton reaction, involving Fe(II)/Fe(III) system, is used to examine the antioxidant capacity of TROLOX, a synthetic antioxidant against hydroxyl free radical.

Brianna Grimes

High School: Orangeburg Wilkinson High School, Orangeburg SC

Research Title: ***Computation Modeling of Molecules***

Mentor: Dr. Bijoy Dey

(INBRE Target Faculty)

Department: Chemistry

Abstract:

The purpose of the "Modeling of Molecules" experiment was to understand different properties of molecules. The focus was on GaussView and Mathcad, software used to detect the types of molecules relevant to the water molecule. Our results showed that the beryllium and carbon dioxide have the same amount of bond angles which was calculated in degrees.

Guye Guinyard

High School: Calhoun County High School, St. Matthews SC

Research Title: ***Controlled Potential Electrochemistry***

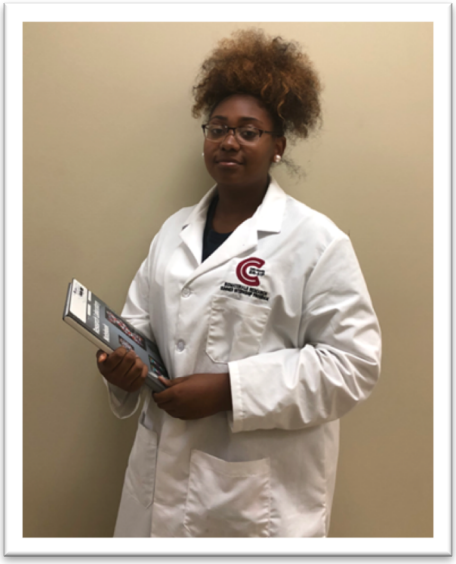
Mentor: Dr. Uruthira Kalapathy

Department: Chemistry

Abstract:

Electrochemistry involves the use of redox reactions to generate electrical energy or uses electrical energy to perform redox reactions. In this project, electrical energy in the form of controlled potential, is used to perform a Fe(II)/Fe(III) redox reaction. Fenton reaction, involving Fe(II)/Fe(III) system, is used to examine the antioxidant capacity of TROLOX, a synthetic antioxidant against hydroxyl free radical.

Taylor Jamison



High School: North Middle High School, North SC

Research Title: ***Plasma Protein Biomarkers of COPD in African Americans and Caucasians***

Mentor: Dr. Derrick Swinton

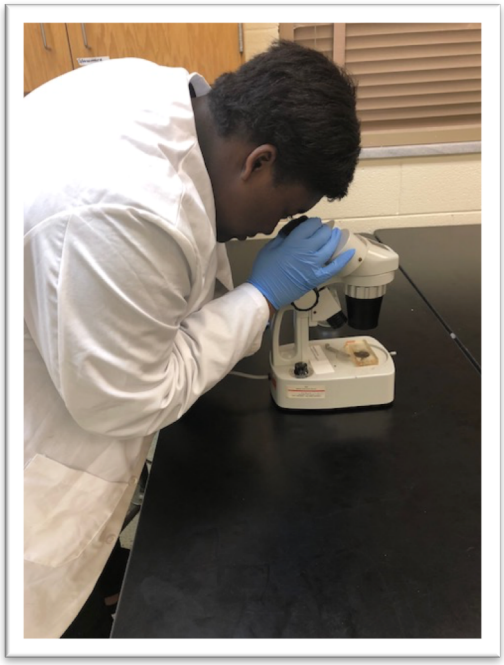
Department: Chemistry

Abstract:

Chronic Obstructive Pulmonary Disease (COPD) is the fourth leading cause of death in the United States. It is mainly caused by cigarette smoking and specific environmental factors. Although for a long time it has been considered a white man's disease, its prevalence is increasing amongst African Americans. The goal of this research project is to identify potential proteomic markers that may explain the differential susceptibility and increased prevalence of COPD amongst African American smokers. We will use protein-profiling to identify molecular pathways and targets related to COPD in attempt to better understand the pathogenesis of this respiratory disease in African Americans. Particularly, we will employ proteomic techniques to shed insight into the disparity in COPD research and identify markers that will enable researchers to: (1) predict risk of progression, allowing early intervention studies; (2) predict

response and outcome; so that treatment decisions can be individualized; and (3) identify novel pathogenetic pathways as targets for therapy.

Keniya Johnson



High School: Edisto High School, Cordova SC

Research Title: ***Isolation of Soil Bacteria that Produce Antibiotics***

Mentor: Dr. Randall Harris

(INBRE Target Faculty)

Department: Biology

Abstract:

An antibiotic is a medicine that a doctor uses to cure bacterial infections. The antibiotics that the doctors give patients do not always cure the bacterial infection because the bacteria can become resistant to the antibiotic. To find an antibiotic from the bacteria in the soil to cure bacterial infections. We collected the soil and mixed it with water. Then we performed a serial dilution of the soil and water mixture. We put the sample on an agar plates and incubated them until the bacteria formed. We transferred the bacteria that formed to fresh plates to see if a zone of

inhibition formed against 9 different test bacteria.2 of the 9 soil bacteria that we tested made a zone of inhibition against Micrococcus luteus and Bacillus subtilis. This research will help to decrease the number of diseases and deaths due to antibiotic resistance.

Dameisha McFadden

High School: High School for Health Professions, Orangeburg SC

Research Title: ***Isolation of Soil Bacteria that Produce Antibiotics***

Mentor: Dr. Randall Harris

(INBRE Target faculty)

Department: Biology

Abstract:

In healthcare doctors prescribe antibiotics to patients with bacterial infections. Bacteria in the body can become resistant to antibiotics. He or she is most likely to get sicker or die. We want to decrease the number of antibiotic resistant deaths and diseases. 75% antibiotics are made by bacteria from the soil. We want to isolate bacteria from the soil that produce an antibiotic. A soil sample was collected, and a serial dilution of soil sample was made. A portion of dilutions was placed onto BHI plates and plates were incubated until bacteria grew. Bacterial colonies were picked and streaked onto new BHI plates. Soil bacteria were combined with test bacteria to produce a zone of inhibition. For soil sampling and plating, the bacteria became less concentrated throughout the dilutions on the five different plates. During streaking technique, bacteria grew, and colonies formed. The test bacteria, Bacillus subtilis and Micrococcus luteus,

were sensitive to the antibiotic made by two of the nine soil bacteria which created a zone of inhibition. The genus and species of the two bacteria will be determined by using Biolog GEN III microplate system.

Jada Simmons

High School: High School for Health Professions, Orangeburg SC

Research Title: ***Investigating the Efficacy of Functionalized Hybrid Gold Nanoparticles as Theranostic Platforms in Dialysis Related Amyloidosis***

Mentor: Dr. Derrick Swinton

Department: Chemistry

Abstract:

Silica functional gold nanoparticles (Au@SiO2) have unique physiochemical properties enabling them to be used in the diagnosis and treatment of diseases (Theranostic Applications). In addition to their tunable localized surface plasmon resonance (LSPR), Au@SiO2 nanoparticles are localized heat sources and can be used in hypothermal cancer treatment. In this project we designed hybrid nanoparticles capable of diagnosing and disrupting protein aggregation. The Au@SiO2 nanoparticles are functionalized with molecules varying their physiochemical properties enabling them to overcome barriers encountered in their usage in clinical applications, particularly penetration across cell and tissue barriers. We have used several techniques to characterize their physiochemical properties and their ability to disrupt amyloid beta aggregation. The overall aims of the project are as follow: (1) investigate the interaction of Au@SiO2 nanoparticles with an amyloidogenic proteins, Amyloid Peptide (Aβ); (2) introduce specificity to the Aβ by functionalizing Au@SiO2 with peptides and other molecules complimentary to regions of each amyloid protein responsible for protein aggregation; (3) examine the potential neurotoxicity, neuromodulatory, and cytotoxicty effects of Au@SiO2 nanoparticles utilizing human neuroblastoma, human iPSC cortical, and SH-SY5Y cell lines. The proposed research

will shed insight into the interactions of nanoparticles with biomolecules and biological systems, thus providing researchers with design principles to engineer nanoparticles effective in diagnostic and therapeutic technologies.

Hadaiya White

High School: Ridge View High School, Columbia SC

Research Title: ***Transformation of bgIA gene into pΔαNH to generate pΔαNH/bgIA***

Mentors: Dr. Arezue Boroujerdi, Dr. Nick Panasik and Ms. Azima Kalsum

(INBRE and EPSCoR Faculty)

Department: Biology & Chemistry

Abstract:

The transformation of the bglA gene into pΔαNH to generate pΔαNH/bglA was completed through a series of procedures (PCR-EP, Restriction Digestion, Ligation, and Transformation) and the screening resulted in white colonies. These white colonies appeared for one of two reasons: the ligation process failed or the bglA gene did not express itself properly. This project helped in learning techniques that are applicable in almost all areas of STEM such as Aseptic Techniques, Serial Dilution, and Bacterial Plate Streaking.

Kendall Wilson

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High School: David W. Butler High School, Charlotte NC

Research Title: ***Plasma Protein Biomarkers of COPD in African Americans and Caucasians***

Mentor: Dr. Derrick Swinton

Department: Chemistry

Abstract:

Chronic Obstructive Pulmonary Disease (COPD) is the fourth leading cause of death in the United States. It is mainly caused by cigarette smoking and specific environmental factors. Although for a long time it has been considered a white man's disease, its prevalence is increasing amongst African Americans. The goal of this research project is to identify potential proteomic markers that may explain the differential susceptibility and increased prevalence of COPD amongst African American smokers. We will use protein-profiling to identify molecular pathways and targets related to COPD in attempt to better understand the pathogenesis of this respiratory disease in African Americans. Particularly, we will employ proteomic techniques to shed insight into the disparity in COPD research and identify markers that will enable researchers to: (1) predict risk of progression, allowing early intervention studies; (2) predict

response and outcome; so that treatment decisions can be individualized; and (3) identify novel pathogenetic pathways as targets for therapy.

Clifton Yates

High School: High School for Health Professions, Orangeburg SC

Research Title: ***Transformation of BgaB gene into pΔαNH to generate pΔαNH/BgaB***

Mentor: Dr. Arezue Boroujerdi, Dr. Nick Panasik and Ms. Azima Kalsum

(INBRE and EPSCoR faculty)

Department: Biology & Chemistry

Abstract:

This research was conducted through the use of the Beta- Galactosidase (BgaB) gene which has been proven to grow and thrive in different environments and temperatures. The transformation of BgaB gene into pΔαNH to generate pΔαNH/BgaB was done through series of techniques like PCR, PCR purification, restriction digest, gel electrophoresis, ligation, and transformation. The result of transformation shows white colonies instead of blue. These white colonies could be either failure of ligation or failure of BgaB gene expression.

This summer project was also very helpful and successful in learning techniques used in molecular biology such as pipetting, aseptic, bacteria culture streaking, gel electrophoresis, gel imaging, etc.