Western Carolinas Section of the American Chemical Society
Program of Poster Abstracts

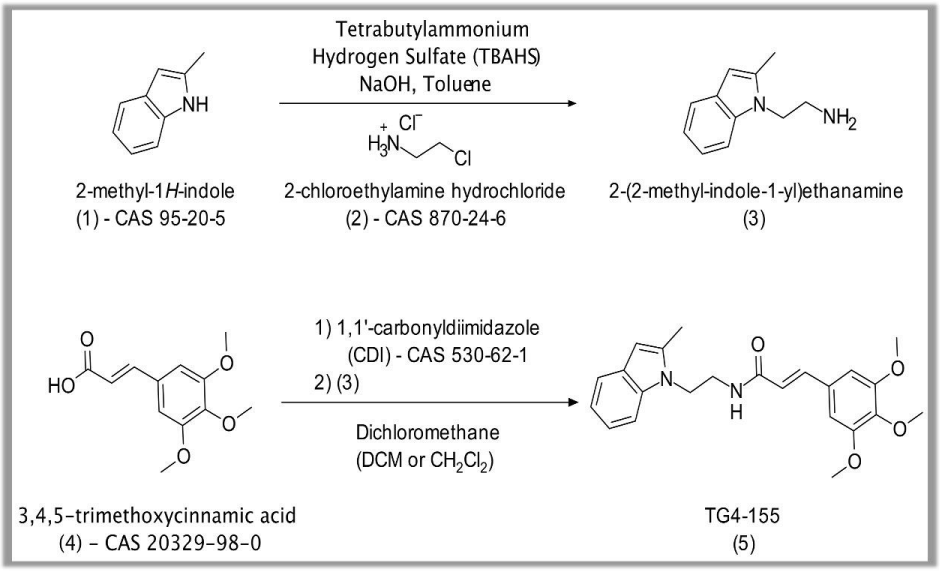
Posters and abstracts are listed in alphabetical order first by school, and then by last name of the presenter.

Student Researchers are Underlined
Faculty researchers are mentioned last
* Denotes 2023 Outstanding senior award winners

#1 TG4-155 Synthesis via Alkylation and CDI Facilitated Amidation

Sarah Knisely*, & Robert E. Lee
Bob Jones University

TG4-155 has biological applications by antagonizing the prostaglandin EP_2in the brain and prostate.[1] This potential API may serve as a treatment for both epilepsy and cancer.[2] In this research, 2-methyl-1H-indole (1) and 2-chloroethylamine hydrochloride (2), were condensed in the presencesodium hydroxide and tetrabutyl-ammonium hydrogen sulfate (TBAHS) under toluene reflux to form 2-(2-methyl-indole-1-yl)ethanamine (3). After flash chromato-graphy, (3) was activated with CDI and combined with 3,4,5-trimethoxycinnamic acid (4) to yield (2E)-N-[2-(2-methyl-1H-indol-1-yl)ethyl]-3-(3,4,5-trimethoxyphenyl)-2-propenamide, TG4-155 (5). Following flash chromatography (FC) and recrystallization, maximum yield for (5) was 59.9% (98% pure by HPLC). FTIR, 1HNMR, GCMS, HPLC, MP, and TLC were used to evaluate raw materials and products.



#2 3,6-dihydroxyxanthone from 2,2',4,4'-tetrahydroxybenzophenone

John O'Dell, Tori Whitlock, & Robert E. Lee
Bob Jones University

Xanthones are known antioxidants found primarily in fruits such as the Garcinia mangostana.1 These natural agents have been targeted for study as a chemopreventive and chemotherapeutic agent in tumor suppression.1 Xanthones are known modulators of P-glycoprotein (P-gp), an ATP-binding efflux pump important in the cellular extrusion of chemotherapeutics. Cellular chemotherapeutic efflux reduction has been the subject of many P-gp inhibition studies.2 Xanthones act as P-gp modulators and their derivatives have been studied in regulation of cellular chemotherapeutic efflux with pharmacokinetic, pharmacodynamic and toxicity applications.3 The goal of this research is to protect 3,6-dihyroxyxanthone (2) through a 4-dimethylaminopyridine (DMAP) catalyzed acetylation with acetic anhydride to synthesize 3,6-diaccetylxanthone (3)

#3 Two-Step Synthesis of 3,6-bis(tert-butyldimethylsiloxyl)xanthone

Henry Woo, & Robert E. Lee
Bob Jones University

Xanthones are a class of phenolic compounds composed of tricyclic aromatic rings that can be used as antioxidants when extracted from plants or fungi. Xanthones have antifungal, antibacterial, and potential medicinal properties. The goal of this research was to protect 3,6-dihyroxyxanthone (DHX) using tert-butyldimethylsilyl chloride (3) to synthesize 3,6-bis(t-butyldimethylsilyoxy)xanthone. Although different protecting groups could be utilized, (3) was chosen due to its lack of a chiral center, its stability, and its appropriateness for GCMS measurements. Regular reaction conditions included using imidazole as a catalyst and DMF as a solvent at a mild temperature. Characterization was done by 1H NMR, FTIR, melting point, HPLC, GCMS and TLC.

#4 Buoyant and Magnetic Capture of Proteins: A Simulation-Based Investigation of Capture Kinetics

Wilkins Taylor* & Jeffrey Anker
Clemson University

We are developing a single-molecule counting test for point of care Covid detection. Buoyant microbubbles and magnetic microspheres, each functionalized with antibodies, co-label SARS-CoV-2 nucleocapsid proteins by forming buoyant and magnetic complexes. To understand the kinetics of buoyant capture, we are simulating with Matlab the capture of proteins by buoyant particles. We first generate a 3D matrix of nucleocapsid proteins with a matrix of buoyant particles underneath. Each nucleocapsid protein and buoyant particle moves by simulated diffusion, and the buoyant particles rise by buoyant force. When a protein comes within a microbubble's radius, it can be "captured" and moves with the microbubble. From this research, we found that buoyant motion enhances protein capture rate, and for constant total microbubble volume, a larger radius accelerates capture. These results will help us optimize experimental protocols and interpret results.

#5 Reaching the Non-STEM students of Erskine College through campus wide events

Olivia Jans & Tiffany Hayden
Erskine College

Erskine College is a small Christian liberal arts college with roughly 800 students. Despite the small size of our student chapter, we are one of the most active organizations on Erskine's campus. There is great participation from the Chemistry Department at Erskine, but not good participation from the nonscience majors at Erskine. The goal of the Erskine College ACS Student Chapter is to reach and educate the student of Erskine in all types of chemistry. This year, COVID-19 restrictions eased on campus, and the Erskine ACS Student Chapter made a conscious effort to begin hosting campus wide events with our purpose of educations in mind. The Erskine ACS Student Chapter took multiple steps to achieve this goal. The first was increasing our communication with the student body. A big part of this was done by the office of the Outreach Coordinator. This person created attention-grabbing flyers for the campus and for social media, made sure the Erskine ACS Instagram account was active, and took the time to personally invite people to our events. The second was planning and hosting events for the whole campus. By having these events, we were able to converse with the non-STEM students about the chemistry and the fun that it can entail.

#6 Photocatalytic Degradation of 6PPD-quinone

Daelyn Ashley Moore* & Joel E. Boyd
Erskine College

N-(1,3-Dimethylbutyl)-N'-phenyl-p-phenylenediamine-quinone (6PPD-quinone) has recently been discovered to be toxic to different fish species such as coho salmon, brook trout, and rainbow trout after just hours of exposure via stormwater runoff. 6PPD-quinone is a transformation product of 6PPD which is an antioxidant and antiozonant used on tires to prevent any degradation. Even though 6PPD and 6PPD-quinone are commonly used in the tire industry, there are no components of stormwater systems that are designed to degrade 6PPD-quinone to prevent fish exposure. In this study, photocatalytic degradation was performed on 3.5 L of 26 ppb 6PPD-quinone using solar illumination and a polymer-titania composite photocatalyst. When exposing 6PPD-quinone to the photocatalyst, over half of 6PPD-quinone was degraded after 5.5 h of pumping through the reactor set up for both the control and the photocatalyst reactor. Future research is needed to determine whether the 6PPD-Q decomposition products from these reactor systems are also toxic to sensitive fish species.

#7 Development of colorimetric biosensors through supported lipid bilayer by polydiacetylene vesicle fusion

Srikar Alapati & Tim Hanks
Furman University

The use of polydiacetylenes (PDA) as biosensors has been a unique area of research because of their high levels of conjugation, leading to optical properties that allow for the creation of colorimetric sensors that are flexible, inexpensive, and portable. These polymers contain a hydrophobic long-chain fatty acids and hydrophilic head groups, leading to the self-assembly of bilayer membranes and bilayer vesicles, known as liposomes. Modification of the carboxylic head groups of 10,12-pentacosadiyonic acid (PCDA) with N-hydroxysuccinimide (NHS) results in a number of further modifications that can be used for bilayer formation or specific headgroup coupling. PCDA-NHS membranes were coated on polyvinylidene difluoride (PVDF) material and were further modified to couple the SARS-CoV-2 antibody for sensitive, specific, and rapid biosensors. However, the PVDF material has shown to be difficult to obtain and use, leading to further studies of bilayer formation using liposomes. Using the quartz crystal microbalance (QCM), the formation of PDA supported lipid bilayers (SLB) is studied through vesicle fusion on silicon dioxide and gold coated sensors. Measurements of frequency and dissipation are used to determine the SLB formation.

#8 Optimization of Paper Spray Mass Spectrometry via Chemically Patterned Paper Substrates

Austin Arias & Mac Gilliland
Furman University

Paper spray mass spectrometry (PS-MS) is an ambient ionization method used to analyze samples. PS-MS has many applications, including in the use of drug detection within blood samples. PS-MS is a cost-effective method relative to other mass spectrometry techniques and requires a small volume of sample for analysis, and paper substrates are inexpensive. One limitation of paper spray is that it does not offer the same level of sensitivity as other methods do. This is due to PS-MS having variability due to the fact that the nature of paper results in the entirety of the sample not going towards the mass spectrometer. However, its practicality increases the necessity to optimize PS-MS. Our research focuses on chemically modifying and subsequently patterning paper substrates to direct the sample toward the mass spectrometer, and thus improve the sensitivity of analyte detection.

Paper patterning was performed via a 2-step process. First, the papers were made hydrophobic by immersing the papers in a solution of trichlromethylsilane in hexanes. Second, we used an oxygen/plasma cleaner to etch the hydrophobic layer away. We used 3D-printed masks in conjunction with an oxygen/plasma cleaner to pattern a 1 mm channel onto the paper. A 2.5 mm thick mask was determined to be the optimum thickness to acquire a 1 mm channel. Other parameters were explored, including the intensity of the plasma and the exposure time. The effectiveness of patterning was determined through PS-MS using a solution of tyrosine as our analyte and L-DOPA as an internal standard. The data was compared with blank samples as well as with uncoated papers. Our next steps will be to explore a range of channel geometries to determine if the size of the channel has an effect on signal intensity. Other silanes are also being used to explore their effect on channel pattern definition.

#9 Progress Towards the Synthesis of Hibiscone A

Felicia Baerje &Brian Goess
Furman University

The furanosteroids are a family of natural products with known chemotherapeutic potential. Herein we report progress towards the total synthesis of hibiscone A, a furanosesquiterpenoid natural product that has never been synthesized before, and whose biological activity as a potential cancer chemotherapeutic is currently not known.

#10 Development of a genetic code expansion system for p-benzoylphenylalanine in Candida glabrata

Colin Burdette & Meghan Breen
Furman University

Candida glabrata is a nosocomial pathogenic fungus that causes candidiasis infections, which have high mortality rates in immunosuppressed and immunocompromised populations due to acquired drug resistance. Previous work to characterize protein-protein interactions regulating drug resistance in C. glabrata have used co-immunoprecipitations. However, these experiments do not give information about the interacting surfaces and often miss capturing weak or transient interactions. Genetic code expansion incorporates noncanonical amino acids site-specifically in proteins and enables using bioorthogonal reactions to covalently capture and map protein-protein interactions in their native environment, but this technique has never been applied in C. glabrata. We have developed and are currently optimizing genetic code expansion tools to incorporate the photocrosslinking amino acid p-benzoylphenylalanine (pBpa) into proteins in C. glabrata. Proof of concept was demonstrated by incorporating pBpa into superfolder GFP at position Y151 (Y151pBpa sfGFP) using an orthogonal translation system consisting of an E. coli tyrosyl-tRNA synthetase (EcTyrRS) and tRNACUAEcTyr pair. Proper functioning of the bioorthogonal EcTyrRS/tRNACUAEcTyr pair was evaluated using western blots to quantify the expression of full length Y151pBpa sfGFP when pBpa is added to the culture medium. Additionally, we are evaluating the presence of photocrosslinked sfGFP dimers after irradiating live cells with 365 nm light. Successful development of this genetic code expansion method will expand the tools available to investigate C. glabrata's proteome, and our lab will apply these tools to study protein-protein interactions regulating drug resistance.

#11 Experimental and Computational Investigation of the Photodecomposition of Emissive d0 Titanocenes

Thomas Whittemore* & Paul Wagenknecht
Furman University

First-row transition-metal complexes are of interest for use as photocatalysts due to their relative earth abundance and low cost when compared to complexes of second- or third-row transition metals. In particular, Cp2TiCl2 has recently been demonstrated to serve as a photocatalyst for epoxide reduction utilizing visible light.1 We have recently demonstrated that titanocene complexes of the form Cp2Ti(C=CR)2 (where R is either a phenyl or arylamine substituent) absorb in the visible region, and are strongly emissive at 77 K from a ligand-to-metal charge-transfer (LMCT) excited state. However, complexes of this type are not photostable in room-temperature fluid solution, with an enyne forming as the chief organic photoproduct.2 TD-DFT calculations using the MN15/LANL2DZ functional and basis set for both optimization and TD-DFT were in good agreement with experimental UV-Vis spectra when R = dimethylaniline or triphenylamine, but in relatively poor agreement when R = phenyl. Including a range of rotamers for Cp2Ti(C2Ph)2 significantly improved agreement. Triplet excited state structures of

the Cp2Ti(C=CR)2 complexes show a compression of the C-Ti-C bond angle, in agreement with eventual formation of a C-C bond. A new molecule, Cp2Ti(OBET), where OBET is a bidentate, chelating, bis-alkyne ligand, was synthesized to investigate the mechanism of decomposition of these complexes. Herein, we report the computational, photophysical, and photochemical investigations of the arylethynyltitanocenes and how their structures and electronic excited states affect the photostability.

#12 Synthesis and Functionalization of Zirconium Tungstate Nanoparticles via Acid Digestion Bomb and Sol-Gel processes for reduction of Coefficient of Thermal Expansion of DGEBA/ED757 Epoxy Substrate

Sontee Irvin, Nicholas Ross, & Andrew La Croix
Lander University

Zirconium tungstate(ZrW2O8)(NPs) were synthesized, functionalized, and dispersed into DGEBA/ED757 epoxy resin to decrease the coefficient of thermal expansion (CTE) of theresin. The sol-gel method was used to synthesize the NPs.1-2synthesis, the surface of the particles was subjected toexchange with silane ligands containing aminegroupspromote covalent attachment to the epoxy resin during polymerization.particles were characterized using thermogravimetric analysis (TGA), x-ray diffraction (XRD), andelectron microscopy(TEM).NPs synthesized were found to be 61% ZrW2O838.1% WO3quantitative XRD analysis.CTE of the epoxy samples was found using a thermomechanical analyzer (TMA). of the study concerning CTE reduction are ongoing, as are studies to ensure appropriate surface ligand coverage of the NPs.

#13 Synthesis, Characterization and Polymerization of Diamino Dibenzo Cyclooctane for CTE Reduction in Epoxy Telescope Mirrors

Nathan Mugande & K. Lisa Brodhacker
Lander University

This study describes the synthesis and characterization of Diamino Dibenzo Cyclooctane (DADBCO) and its application in reducing the Coefficient of Thermal Expansion (CTE) of epoxy mirrors used in telescopes. DADBCO is synthesized from α,α'-dibromo-o-xylene in a complex reaction process, followed by characterization using proton and carbon NMR spectroscopy to determine the products' connectivity. Various isomers of DADBCO are separated using techniques such as chromatography and distillation. The cis-isomer of DADBCO is then incorporated into epoxy mirrors to reduce the CTE. The incorporation of DADBCO improves the reliability and durability of the mirrors with temperature changes. This study highlights the importance of modifying materials' properties to improve their performance in specific applications.

#14 A fast algorithm to estimate the binding free energy of peptides on solid surfaces

Bongwe Ngwenyama* & Andrew La Croix
Lander University

It has been shown that proteins control biomineralization in organisms such as diatoms. The biomineralizing ability of these peptides has being harnessed for the production of inorganic materials with a wide range of uses including drug delivery. Previous studies have shown that the binding affinity of an SBP to a solid critically influences the morphological control of the material during biomineralization. Mining of solid binding peptides (SBPs) has been experimentally time consuming and computational methods such as meta dynamics are computationally expensive.
Here, we aim to establish that the binding free energy of a polypeptide chain can be estimated from a linear combination of the free energy contribution of each residue at its equilibrium position. Vanilla molecular dynamics simulations of Car9 (a 12-amino acid residue peptide) were combined with the binding free energies of individual amino acids obtained from meta dynamic studies. The total binding free energy was calculated from the probability distribution of the COMs of the amino acids relative to the silica surface and their corresponding energies. The experimental binding free energy was found to be -15.27KJ/mol and statistically different from -12.57 KJ/mol calculated for the same peptide using meta dynamic simulations.

#15 The Effects of Dietary Iron on Taxonomic Composition and Function of the Zebrafish Gut Microbiome

Megan Whisonant & Stuart Gordon
Presbyterian College

A healthy gut microbiota is essential to promote host health and well-being, therefore, effects of dietary components on the gut microbiome are important to investigate as the gastrointestinal tract can be a major route of infection. Iron-an essential component of heme and iron-sulfur proteins plays a central role in many biological activities, including oxygen transport and cellular respiration. In particular, the iron homeostasis system is one of the best characterized due to iron's causative relationship with iron-deficiency anemia. Dietary iron supplementation is a commonly used treatment for iron deficiency anemia; however, the known direct impacts of iron on the gut microbiome functional potential remain limited.

In the present study, using Zebrafish (Danio rerio) as a model organism, we sought to determine if increases in dietary iron would cause changes in taxonomic composition and gut microbiome function. Based on our analysis, an increase in dietary iron significantly altered the zebrafish microbiome taxonomic composition with specific increases in Firmicutes and Proteobacteria. Analysis of taxa for functional potential suggested that iron enriches physiological functions such as aerobic respiration. These results will be further explored through a spectroscopic analysis of primary metabolites and lipids.

#16 Suppression of IL32-beta in breast cancer stem cell lines to determine its role in cancer metastasis through ECM remodeling and invasiveness

Megan Wilson* & Evelyn Swain
Presbyterian College

Basal-like breast cancers typically correspond with increased enrichment of cancer stem cells (CSC) and propensity toward metastasis and migration. However, molecular mechanisms underlying these general characteristics is not well understood. A prior 450k DNA methylation profile comparing CSC-poor cell lines to that of CSC-enriched breast cell lines alluded to hypomethylation in the IL32 promoter. The correlation with both hypomethylation and increased differential expression of IL32 beta in breast CSC-rich cell lines has resulted in the canonical interleukin to be of keen interest. We sought to determine the effects of suppressing IL32 in CSC-rich cell lines by performing an siRNA-mediated transfection targeting IL32, RNAseq differential expression analysis as well as a multi-pathway phosphorylation protein array that evaluated the MAPK, AKT, JAK/STAT, TGFB, and NFKB pathways. From our RNAseq results, we determined that there was notable enrichment in siIL32 treated CSC-enriched cells of upregulated pathways involved in extracellular matrix (ECM) organization as well as enrichment of downregulated pathways involved in cellular and replicative stress responses. Furthermore, IL32 suppression decreased cell invasion in both an ECM-matrix cell invasion assay and a chick CAM xenograft/angiogenesis model. Furthermore, our RNAseq results corresponded with our protein phosphorylation array where we observed a decrease in phospho-JNK and phospho-NFKB in siL32-treated cells, both of which are well-established events that can coordinate both cell stress responses and cellular invasion. Collectively, our results reflect the notion that differential IL32 expression by promoter hypomethylation in breast CSCs plays a role in mitigating intracellular stress and subsequently promoting breast cancer cell invasion.

#17 Heterologous expression of Pseudomonas aeruginosa ATP synthase in E. coli to facilitate antibiotic discovery

Vesper Fraunfelter & Ryan Steed
University of North Carolina, Asheville

Bacterial multidrug resistance (MDR) is a prevalent and increasing threat, necessitating the constant development of new antibiotics, preferably with novel mechanisms of action to avoid existing resistance. Targeting the bioenergetic pathways of bacteria has shown promise in overcoming drug-resistance, as demonstrated by the diarylquinoline bedaquiline, which is effective against the ATP synthase of Mycobacterium tuberculosis. Expanding on this strategy, we are screening drug candidates to identify effective inhibitors of the ATP synthase of Pseudomonas aeruginosa (PA), an opportunistic, Gram-negative pathogen that already exhibits MDR in the clinic. To facilitate the design and testing of new inhibitors, we constructed a plasmid to express PA F1Fo ATP synthase in Escherichia coli. The plasmid, pASH20, derived from the ampicillin-resistant vector pBR322, contains the PA ATP synthase (atp)

operon under the control of the native E. coli atp (unc) promoter and encodes an affinity tag on the N-terminus of the beta subunit to facilitate future F1Fo purification. Expression of functional ATP synthase was verified by growth of transformant E. coli on succinate minimal medium. Additionally, inverted membrane vesicles prepared from transformant E. coli showed in vitro ATP synthesis and hydrolysis activities. Successful expression of PA ATP synthase from pASH20 enables future mutagenesis and purification experiments to aid in the design of effective antibiotics targeting PA bioenergetics.

#18 Two-tiered approach to combating antibiotic resistance

Casey Kellogg & Amanda Wolfe
University of North Carolina, Asheville

Antibiotic resistance in Gram-negative bacteria is exacerbated due to decreased antibiotic development and accumulation issues. Prior research has shown that natural products and their derivatives account for 73% of approved antibacterial agents between 1981 and 2014 due to their unique structural motifs. When under a competitive environment with minimal media conditions, non-pathogenic rhizosphere soil bacteria possess the ability produce novel natural products in co-culture. It has also been demonstrated that antibiotic accumulation in Gram-negative bacteria is increased with the addition of guanidinylated functional groups. Herein, a two-fold approach to combating antibiotic resistance using natural product isolation and adjuvant-antibiotic hybrids will be discussed.

#19 Development of cleavable antibiotic-adjuvant hybrid compounds for increased accumulation in gram-negative bacteria

Bryce Pugh & Amanda Wolfe
University of North Carolina, Asheville

Antibiotic resistance has become a serious threat, and the need for novel methods for combatting it is greater than ever. Adjuvants capable of promoting accumulation by permeation of the outer membrane (OM) of Gram-negative bacteria have proven to overcome a common method of resistance. Previously, we designed a series of novel OM adjuvants that were synthesized and evaluated for their ability to accumulate in Gram-negative Escherichia coli (EC) and Pseudomonas aeruginosa (PA). One adjuvant containing guanidinium groups showed high accumulation in EC and PA. Because of its ability to accumulate within these bacteria, the guanidinium adjuvant is now being used to synthesize cleavable antibiotic-adjuvant hybrids as a way of translating this accumulation to antibiotics. The use of cleavable linkers will allow for the antibiotics to achieve these high levels of accumulation before being released into the periplasm of the cell unaltered. Linking conditions to synthesize the antibiotic-adjuvant hybrids are currently being explored. Upon synthesis, the hybrid compounds will be evaluated via accumulation assays and cell death assays.

#20 Probing electrostatic interactions in the Fo motor of Escherichia coli ATP synthase

Sam Shepard* & Ryan Steed
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ATP Synthase is a molecular motor that utilizes a rotary mechanism to synthesize adenosine triphosphate (ATP), the fundamental energy currency of life. The torque for this mechanism is generated in the membrane-embedded Fo motor where protons flow down the electrochemical gradient through two half channels. In E. coli, the Fo motor is composed of a c10 ring (rotor) alongside subunit a (stator), and the H+ exit half channel is located at this rotor-stator interface. The mechanism by which proton translocation is converted into torque on the c-ring is not fully understood. Previous work has suggested that conserved residues aAsp92, aGlu196, and cArg50 in the proton exit pathway are important for proton transport and possibly for torque generation. To investigate the roles of these residues, we generated 28 substitution mutants and assayed their in vitro ATP synthesis, H+ pumping, and H+ permeability activities as well as the ability of mutants to carry out oxidative phosphorylation in vivo. Mutations of aGlu196 caused only mild effects on proton pumping, while moderately inhibiting ATP synthesis. These results indicate that aGlu196 is likely not interacting with cArg50 but do suggest that it may have a greater role in ATP synthesis than in H+ pumping. In contrast, mutations of aAsp92 were not well tolerated, and mutations that reverse the charge of cArg50 caused a substantial defect. Interestingly, alteration of charge density at the C-terminus of subunit a, which also lies in the exit channel, was able to rescue this defect, suggesting an electrostatic interaction between cArg50 and subunit a. These results begin to uncover a novel rotor-stator interaction in the H+ exit channel that may contribute to H+ translocation and torque generation.

#21 Interaction Between the Viral RNA Leader Sequence and NSP1 in SARS Coronavirus

Johnathan Luke Cromer*, Kaitlin Marie Caughman, & Anita Nag
University of South Carolina, Upstate

Nonstructural protein 1 (NSP1) of severe acute respiratory syndrome coronavirus (SARS-CoV), inhibits host translation by blocking the mRNA binding site on the 40S ribosome complex and by cleaving host mRNA. Stem-Loop-1 (SL-1) of the viral RNA leader sequence has been identified to bind to NSP1, allowing viral RNA to escape translation repression. However, the specific residues on NSP1 and the specific sequences on SL-1 important for binding have not been experimentally verified. To investigate this, we used a gel-shift assay to verify the binding between purified NSP1 and biotinylated RNA containing the SL-1 sequence. Based on recent literature, we hypothesize that disruption of the stem region of SL-1 and mutation of R124 and K125 amino acids of NSP1 will decrease this interaction. The results of this study will increase knowledge of how viral RNA is able to escape host translation shut-off. To investigate the binding of NSP1 to SL1, we used LightShift Chemiluminescence RNA EMSA Kit (Promega) to detect the RNA in complex with NSP1 in a gel shift assay. Contrary to our hypothesis, we

found an increase in NSP1 binding to the RNA carrying stem mutation and a decrease in NSP1 binding to the RNA with the loop mutation. Moreover, NSP1 forms two distinct complexes with SL-1 RNA but the smaller complex is predominant when NSP1 binds an RNA with a stem mutation. Our results suggest that there are multiple steps of nsp1 binding to viral RNA that possibly begin with recognition of the loop region.

#22 Optimizing the reaction conditions of europium-doped calcium fluoride nanoparticles using a microwave-assisted synthetic method

Jacob England* & Channa De Silva
Western Carolina University

Europium-based nanoparticles have unique luminescent characteristics including narrow emission bands, longer luminescent lifetimes, limited photobleaching, and larger Stoke shifts. They have potential applications in cellular imaging, bio-analytical sensing, and luminescent assays. In the past, we have developed a microwave-assisted reaction to synthesize europium-doped calcium fluoride nanoparticles in aqueous phase with an average particle diameter of 40 nm. While the reaction has been proven to work, there is now a need to determine how the nanoparticle size can be tailored by changing the reaction conditions. In this work, the heating time of the microwave-based reaction was altered to obtain nanoparticles with varying nanoparticle sizes. The nanoparticles were characterized using powder X-ray diffraction, dynamic light scattering, infrared spectroscopy, absorption, and luminescent spectroscopy. The correlation between the heating time and the average particle size will be discussed.

#23 Efforts Towards the Design and Synthesis of a New Aminotroponiminate Supported Zinc Complex for Intermolecular Hydroamination

Colin Dral* & Robert Harris
Wofford College

Amines are an important class of molecules for biomedical, agriculture, and medicinal chemistry. Hydroamination is an expedient and atom economical method for the synthesis of amines. While intramolecular hydroamination of alkenes has been well documented, intermolecular hydroamination of alkenes has proven to be more difficult. Based on mechanistic observations previously reported of zinc catalyzed hydroamination of alkenes, we have designed a new aminotroponimine ligand (L2) for zinc. A previous version of this ligand (L1) favored the formation of a catalytically inactive (L1)2Zn complex. L2 incorporates a bulky 2,6-diisopropyl substituent to disfavor the bisligated complex. L2 is readily obtained in 5 steps from commercially available tropolone. The following highlights the design and synthesis of L2Zn+.

#24 The Synthesis and Characterization of End-group Modified Poloxamers

Hayden Fredericks & Robert Harris
Wofford College

The need for novel cell membrane healing therapeutics are of great significance to the medical community, as the plasma membrane is the key feature in maintaining conventional cellular responsibilities. Poloxamers (polyalkylene oxides) have been shown to provide enhanced structural stability to the cell membrane and possess membrane resealing properties. Moreover, the addition of a small molecule therapeutic agent as a cofactor could potentially increase the effectiveness of the polymer. Hence, the attachment of these small molecules as head groups to poloxamers may improve the cell membrane healing properties of poloxamers, further attenuating cellular injury and death. Here, we report the synthesis and characterization of these targeted molecules.