

# College of Applied and Natural Sciences

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**College of Applied and Natural Sciences  
ANS Day & ANS Research Symposium  
Louisiana Tech University Student Center**

April 11, 2019

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**8:00 – 10:00 AM Oral Presentations** - Names of oral presenters are listed below.  
(*Student Center Rooms 222 and 224*)

- 8:00-8:05 Introduction - Dr. Bill Campbell, Associate Dean for Research
- 8:05-8:20 Hannah Logan, B.S. Biology Student, School of Biological Sciences
- 8:20-8:35 Anusha Elumalai, M.S. Biology Student, Molecular Science and Nanotechnology
- 8:35-8:50 Chukwumabim Nwoku, Ph.D. MSNT Student
- 8:50-9:05 Rebekah Magee, M.S. Biology Student, School of Biological Sciences
- 9:05-9:20 Conner Hartupee, B.S. Biology Student, School of Biological Sciences
- 9:20-9:35 Chris Miller, Ph.D. MSNT Student, School of Biological Sciences
- 9:35-9:50 Jason Holderiath, Assistant Professor, School of Agricultural Sciences and Forestry

**8:30 – 11:30 AM Poster Viewing Session** – Poster presenters will be in attendance.  
(*Main Floor of Student Center*)

Posters will be presented by students and faculty members from academic units within the College of Applied and Natural Sciences

**11:30 – 1:00 PM Lunch Buffet** - Free for ANS students, faculty, staff, and invited guests  
(*Main Floor of Student Center*), tickets available in academic unit offices

**12:15 - 1:00 PM ANS Student and Faculty Awards**  
(*Main Floor of Student Center*)

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# Investigating the Role of Notch 1 and Notch 3 in Human Adipose-Derived Stem Cell Adipogenesis

Hannah Logan<sup>1</sup>, MengCheng Liu<sup>2</sup>, and Dr. Jamie Newman<sup>3</sup>

<sup>1</sup>*Undergraduate, School of Biological Sciences, Louisiana Tech University*

<sup>2</sup>*Graduate, biological Sciences, Louisiana Tech University*

<sup>3</sup>*School of Biological Sciences, Louisiana Tech University*

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Human adipose-derived stem cells (hASCs) are multipotent stem cells that have the ability to self-renew and differentiate into a limited number of cell types of the mesodermal lineage making these cells an attractive tool for regenerative medicine and cell-based therapies. The Notch signaling pathway is a contact dependent cascade that modulates many important cellular processes, including cell-to-cell communication, cell-fate determination during development, and cell proliferation. Irregularities of the Notch pathway are linked to a variety of devastating developmental disorders and cancers.

Following exposure to adipogenic media hASCs displayed increased levels of Notch1, Notch3, and downstream target genes, *hes1* and *hey1*. In order to better understand the role of Notch3 we performed an siRNA-mediated knockdown of Notch3 during adipogenesis. Oil Red O staining revealed that the loss of Notch3 promoted the accumulation of lipid vesicles while qRT-PCR and western blot assays revealed that the expression level of known adipocyte markers increased following the loss of Notch3 as did the level of activated Notch1. Finally, immunofluorescence was performed to investigate the localization of both Notch3 and Notch1 and revealed that Notch1 was only enriched in adipocyte differentiated hASCs, while Notch3 was activated in hASCs undergoing adipogenesis.

These results suggest that Notch1 is expressed in adipocytes to promote lipid accumulation while expression of Notch3 in adjacent hASCs is activated by differentiated adipocytes to maintain multipotency. As our investigation continues, we will have a more thorough understanding of the role of Notch1 and Notch3 in stem cell self-renewal and adipogenesis.

## **The Strontium-Coated Clay Nanoparticles in Calcium Phosphate Cement for Biomedical Applications**

Anusha Elumalai<sup>1</sup>, Yangyang Luo<sup>1</sup>, Ahmed Humayun<sup>1</sup>, David. K. Mills<sup>2</sup>

<sup>1</sup>*Graduate student, Molecular Science and Nanotechnology, Louisiana Tech University,*

<sup>2</sup>*Professor, School of Biological Sciences, Louisiana Tech University*

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The use of strontium (Sr) for bone regeneration has garnered interest over the past few years due to its beneficial properties in treating bone loss associated with osteoporosis. Sr and calcium share many chemical similarities. Incorporating Sr nanoparticles in bone tissue results in bone strengthening, induction of bone formation by osteoblasts and reduction of bone reabsorption by osteoclasts. In this project, we coated halloysite (HNT) using strontium carbonate (SrHNT) in a single step process without the use of harmful chemicals or the production of toxic waste. To analyze the SrHNT coatings we used Scanning Electron Microscopy (SEM), Fourier-Transformed Infrared spectroscopy (FTIR) and EDX to confirm the presence of Sr on HNT surface. We further tested the antibacterial properties of Sr coated HNTs on *Escherichia coli* and *Staphylococcus aureus* by the micro-titration method. We then assessed any potential cytotoxicity of our SrHNTs on a pre-osteoblast cell line (MC 3T3). Further tests were to determine SrHNT effects of cell proliferation and osteogenesis. We are still at the preliminary testing phase of our Sr coated HNTs, however, our results to date indicate that we have successfully coated strontium onto the HNT surfaces, on a small and large scale by a one-step method. Embedding these Sr nanoparticles in calcium phosphate paste may enhance the biocompatibility, antimicrobial properties, osteoinductivity, osteoconductivity, and biodegradability of the paste.

## Microprobe-based platform for rapid immunocapture and genetic analysis of exosomes

Gergana G. Nestorova<sup>1</sup>, Chukwumaobim D. Nwokwu<sup>2</sup>, Saif Mohammad Ishraq Bari<sup>3</sup>

<sup>1</sup> Assistant Professor, School of Biological Sciences, Louisiana Tech University

<sup>2</sup> PhD student, Molecular Science and Nanotechnology, Louisiana Tech University

<sup>3</sup> PhD student, Micro and Nanoscale Systems Engineering, Louisiana Tech University

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Detection and analysis of circulating exosomes is an emerging method for precise and non-invasive diagnosis and disease monitoring. However, their clinical utilization as biomarkers has not been fully realized due to technical challenges encountered in current liquid-phase methods for exosomes isolation notably, contamination by non-exosomal proteins reported in high-speed ultra-centrifugation methods. To address this, we successfully developed and characterized an immune-affinity method for solid-phase exosomes purification using stainless-steel microneedles (140  $\mu\text{m}$  diameter; 30 mm length) functionalized with an anti-CD63 antibody specific to a marker expressed on the surface of the exosomes. The capture efficiency of the microprobes was assessed via EXOCET colorimetric assay. The microprobes were incubated in astrocyte-derived exosome suspension enriched by a standard polymer precipitation kit, under different experimental conditions. Blocking experiments (3% BSA in PBS) were performed to eliminate non-specific binding. Our results indicated that the exosome loading capacity increased 10-fold when the needles were incubated overnight on ice ( $40 \times 10^6$  exosomes per needle) than those incubated for 2 hours at room temperature ( $3.5 \times 10^6$  exosomes per needle), suggesting that longer incubation times at lower temperatures favor exosome capture. We further investigated whether the surface area of the microprobes and the type of biological sample had an effect on the loading efficiency of the immunocapture technique. Our results confirm increased exosome loading capacity with increased microneedle dimensions (300  $\mu\text{m}$  diameter  $\times$  30 mm length) as well as with direct incubation in cell culture medium collected from astrocytes derived cell media. The captured exosomes were lysed and the small RNA fraction was purified for subsequent RT-qPCR microRNA analysis. The RNA capture efficiency of an array of 10 probes was sufficient for successful miRNA amplification and detection. The antibody coated probes demonstrated excellent small RNA extraction performance with quantification cycle value for miR-21 and SNORD47 of 15.8 and 13.2 respectively. Future work will focus on the characterization of the proteomic cargo of captured exosomes and integration of the microprobe-based approach into a lab-on-a-chip platform.

## Effects of leaf litter on amphibian oviposition site selection

Rebekah Magee<sup>1</sup>, Julia E. Earl<sup>2</sup>

<sup>1</sup>Graduate Student, School of Biological Sciences, Louisiana Tech University

<sup>2</sup>Assistant Professor, School of Biological Sciences, Louisiana Tech University

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Leaf litter plays an important role in the forest ecosystem, such as impacting various processes and hindering erosion. While there is variability in the chemical and nutritional properties of leaf litter, the effects that these variables have on organisms within the environment is not well known. In this study, we examined the effects of leaf litter chemistry on amphibian oviposition site selection. Artificial ponds were created using small, plastic pools, and leaf litter of 15 different tree species (including two invasive species) was added. During the 60 day experiment, water quality measurements were taken weekly from each individual pool (including temperature, pH, dissolved oxygen, conductivity, and water depth), and the amount of eggs deposited by Cope's gray treefrog (*Hyla chrysoscelis*) was recorded. Using zero inflated models, results show that tree species was the most accurate predictor of the amount of eggs deposited into each pool. Frogs had a strong preference for post oak leaves, while they completely avoided southern red oak leaves. Tree species also had an effect on the amount of nitrogen, phosphorus, and tannins (a type of secondary compound in tree leaves). These results indicate that cues from tree species have a strong impact on habitat selection for amphibians, which may impact ecosystems in broader ways through changes in amphibian abundance and diversity.

## **Investigating chromatin interactions with Mediator subunits through Chromatin Immunoprecipitation (ChIP)**

Conner Hartupee<sup>1</sup>, Joseph Straub<sup>2</sup>, Jamie Newman<sup>3</sup>

<sup>1</sup>*Undergraduate student, School of Biological Sciences, Louisiana Tech University*

<sup>2</sup>*Graduate student, School of Biological Sciences, Louisiana Tech University*

<sup>3</sup>*Assistant Professor, School of Biological Sciences, Louisiana Tech University*

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Human Adipose-Derived Stem Cells (hASCs) are multipotent stem cells with the potential to self-renew, differentiate, and suppress inflammation. As hASCs continue to be tested in clinical trials for their therapeutic potential, scientists seek a more complete understanding of how stem cell state is maintained and how cell fate is determined. The behavior of hASCs is determined by signaling pathways, transcription factors, co-factors, and the gene expression profile that they regulate. The kinase domain of the Mediator complex is a critical regulatory element responsible for activating cell-type specific transcription factors that control gene expression. Through these mechanistic interactions, we aim to further investigate Mediator's potential role in transcriptional regulation of hASCs. Chromatin Immunoprecipitation (ChIP) is a multi-step process that isolates and enhances the genomic regions upon which transcription factors and other proteins bind. Each step of the ChIP protocol requires optimization and step-by-step validation to confirm interaction of target proteins with specific regions of the genome; specifically, genomic regulatory regions where Mediator is responsible for directing transcription. Further optimization must be conducted in order to determine the efficiency of binding and the location within the genome that the kinase domain interacts with. Our goal in this research is to better understand what role the Mediator kinase domain has in stem cell regulation. This information contributes towards our larger body of understanding on how stem cell's differentiate into distinct lineages, bringing us closer to a well-controlled stem cell therapy.

## Investigating Expression Levels of the Notch Pathway in Self-Renewing hASCs

Chris Miller<sup>2</sup>, Avery Bryan<sup>1</sup>, John Bradley Cart<sup>1</sup>, Mengcheng Lieu<sup>2</sup>, Dr. Jamie Newman<sup>3</sup>

<sup>1</sup>*Undergraduate student, School of Biological Sciences, Louisiana Tech University*

<sup>2</sup>*Graduate student, Molecular Science and Nanotechnology, Louisiana Tech University*

<sup>3</sup>*Assistant Professor, School of Biological Sciences, Louisiana Tech University*

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Human adipose-derived stem cells (hASCs) can be used in regenerative medicine to treat connective tissue injuries and degenerative conditions. Although hASCs provide a cell source to repair bone, muscle, and cartilage, additional studies need to be performed in order to properly characterize and manipulate these cells for use in the clinic. The Notch pathway is highly conserved across many species and consists of 4 receptors and 5 ligands, each performing vital cellular functions throughout development<sup>1,2</sup>. Here we present data on the expression of protein and transcript of genes associated with the Notch pathway in hASCs. We also decreased expression of Notch3 mediated by an siRNA to study the influence of Notch3 on self-renewal in order to better understand the dynamic nature of this pathway. Notch3 is known to specifically regulate differentiation of hASCs<sup>3</sup>, but the exact mechanism and relationship between Notch receptors during self-renewal remains poorly understood. Human ASCs were grown in complete culture media (CCM) to maintain self-renewing properties until completely confluent at which point, they were lysed to collect protein and RNA. Protein samples were collected and western blots were performed to monitor expression of Notch receptors. RNA was collected in Trizol, extracted following the manufacturers protocol, and further subjected to cDNA synthesis. Primers were designed for reverse-transcriptase polymerase chain reaction (RT-PCR) for each of the Notch receptors and ligands. All experiments compared negative control siRNA treated cells to those exposed to an siRNA mediated knockdown of Notch3. Western blot analysis was used to validate the Notch3 knockdown and demonstrated significant differences in Notch4 expression following the loss of Notch3 (Figure 1) indicating that Notch3 may play a role in regulating expression of Notch4 during hASC self-renewal. Primers have been designed and optimized to detect transcripts for notch1-4 and ligands jagged1-2, dll-1, dll-3, and dll-4, and this data will allow us to better understand the relationship between Notch3 and other members of the signaling pathway, helping to establish the mechanistic action and future manipulation of these cells for clinical application. Bibliography 1. Song BQ, Chi Y, Li X, et al. Inhibition of Notch Signaling Promotes the Adipogenic Differentiation of Mesenchymal Stem Cells Through Autophagy Activation and PTEN-PI3K/AKT/mTOR Pathway. *Cell Physiol Biochem*. 2015;36(5):1991-2002. 2. Hori K, Sen A, Artavanis-Tsakonas S. Notch signaling at a glance. *J Cell Sci*. 2013;126(10):2135-2140. 3. Sandel DA, Liu M, Ogonnaya N, Newman JJ. Notch3 is involved in adipogenesis of human adipose-derived stromal/stem cells. *Biochimie*. 2018;150:31-36.

## **Update on Purchasing a Server for Developing a Spatially-Explicit Agent-Based Model of Impacts from Climate Change on Louisiana Agriculture**

Michael K. Crosby<sup>1</sup> Jason Holderieath<sup>2</sup>

<sup>1</sup>Assistant Professor, School of Agricultural Sciences and Forestry, Louisiana Tech University

<sup>2</sup>Assistant Professor, School of Agricultural Sciences and Forestry, Louisiana Tech University

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The long-term goal of this research partnership is to develop a spatially explicit agent-based model to determine the impacts of climate change and extreme weather events on agriculture in Louisiana. We have added a collaborator, T. Eric McConnell, and will begin using our server for modeling as soon as possible.

As an intermediate step, to learn about machine learning and county level modeling of agricultural activities we are working on an assessment of the potential impacts to producers and consumers of corn, soybeans, wheat, rice, and peanuts as wild pigs continue to spread north. The assessment uses a random forest machine learning model to determine the probability of invasion in a given county in three time periods. The probability of invasion is then compared to a randomly generated number to determine if the county is actually invaded in a given simulation. Damage is inflicted on newly invaded counties and an economic model is used to estimate the economic costs.

This process, which is substantially less complicated than our end goal, currently takes approximately 17 hours at a cost of approximately \$0.03 per minute for a considerably less capable machine than we are purchasing. We hope to save time and be able to build increasingly complex and impactful simulations without the need to pay for server time from third-parties.

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## **Improving Respiratory Management in Children: A collaborative approach to using pediatric specific supplies.**

Sarah McVay, MSN, RN<sup>1</sup>, Patti McFadden, PhD, RN, SANE-A<sup>2</sup>

<sup>1</sup>*Assistance Professor, Division of Nursing, Louisiana Tech University*

<sup>2</sup>*Associate Professor, Division of Nursing, Louisiana Tech University*

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Improving Respiratory Management in Children: A collaborative approach using pediatric specific supplies. Sarah McVay, MSN, RN, Assistant Professor Patti McFadden, PhD, RN, SANE-A, Associate Professor Division of Nursing, Louisiana Tech University Respiratory infections in infants account for the majority of acute illnesses and emergency situations in children. The anatomy and physiology and size of the infant and young child predispose the risk of airway impairment and occlusions. Respiratory equipment is unique for this population and range is a variety of sizes, shapes and colors to promote correct use and compliance for the child and family. The intent is to enhance pediatric simulation equipment for a more realistic clinical experience in the area of pediatrics for nursing students enrolled in Child Health Maintenance courses. The introduction of pediatric specific respiratory equipment was implemented during didactic teaching on campus along with collaboration at Willis-Knighton Healthcare System simulation which currently has a lack of these age appropriate respiratory tools. Students were able to experience a greater sense of realism to better prepare them for actual client interactions in an enhanced simulation environment that provides actual equipment used in the healthcare field. In the Child Health Maintenance course, one of the expected student learning outcomes is to demonstrate effective verbal and non-verbal communication skills for collaborative interactions within multi-disciplinary teams in planning and providing safe nursing care to children. Utilizing respiratory supplies in simulated clinical scenarios provides students a better understanding in the application of evidence-based practice to ensure family-centered care. Simulation and hands on learning provides an engaging atmosphere that as an integral component of the curriculum in the Division of Nursing, providing an environment of safety in which skills can be mastered, communication techniques and therapeutic approach can be practiced, and questions can be answered in an environment that is faculty proctored, peer-friendly, and centered in a simulating learning environment. The realistic experience decreases anxiety and promote confidence in student nurses. This confidence is then reproduced in a live setting such as the hospital or pediatric clinic settings.

## **Louisiana Tech’s Parkinson Resource Center Nursing Student Scholars**

Nina Collins<sup>1</sup>, Mary Reagan Moran<sup>1</sup>, Abigail Sellers<sup>1</sup>, Shelby Strange<sup>1</sup> Tara Haskins, DNP, RN<sup>2</sup> and Donna Hood PhD, RN, CNE<sup>3</sup>  
Samira Fazel PhD<sup>4</sup>

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**Background** A diagnosis of Parkinson’s disease (PD) impacts the individual diagnosed as well as their family and carepartners. Parkinson’s Disease is a chronic progressive neurodegenerative disorder caused by the loss of neurons in the substantia nigra of the brain resulting in a dopamine deficiency. Common symptoms of PD include resting tremors, slow movement, rigidity, postural instability, freezing, micrographia, mask-like expression, difficulty swallowing, loss of smell, mood disorders, sleep disorders, hallucinations, and memory difficulties. Due to the wide range of symptoms, PwP require a health care team approach to treat their symptoms and improve quality of life. People with Parkinson’s (PwP) in rural areas such as north Louisiana and south Arkansas have limited access to PD specialists and resources. The Parkinson Resource Center (PRC) at Louisiana Tech was created by Edmond J. Safra Visiting Nurse Faculty scholars, Dr. Tara Haskins and Dr. Donna Hood through a grant from the Parkinson’s Foundation. The Center has a two-fold purpose: 1) raise community awareness and PD self-efficacy in those with PD and their care partners, and 2) develop the next generation of PD advocates through the Nursing Student Scholar program.

**Method** Student scholar impact is evaluated through a pre-test, post-test design comparing student scholars with a control students.

**Discussion** Student scholars, selected for a one-year experience, use key national resources for self-directed education about PD, current treatments and therapies for PD, and to connect with existing resources for PD. They organize available resources, develop tools for data collection, coordinate and participate in outreach visits, communicate with individuals seeking information, work with faculty to increase available resources, and complete weekly journaling of their experiences.

## Assessing Water Quality of Redwine Creek in the Grambling, LA Area

William B. Patterson<sup>1</sup>, Annabelle Grounds<sup>2</sup>, Hannah Roppolo<sup>3</sup>, Matthew Lacrouts<sup>3</sup>, Spencer White<sup>3</sup>, Tristen Nicholas<sup>3</sup>, and Travis Williams<sup>3</sup>

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The FOR 402 Watershed Management class at Louisiana Tech University has measured water quality in Redwine Creek in Lincoln and Jackson Parishes since 1998. Redwine Creek at Ansley Road in Jackson Parish (former Jackson-Bienville Wildlife Management Area) had elevated levels of phosphate at times during the period 1998 to 2016. In order to understand this observed trend, students from 2013 to the present measured water quality in Redwine Creek at five locations: near its headwaters at Fiberboard Rd. west of Grambling, Igoe Inn Rd. west of Grambling, Grambling State University at Facilities Rd., at US 80 just downstream of the City of Grambling's water treatment plant, and downstream at Ansley Rd. in Jackson Parish. Discharge (flow) was calculated based on measured velocity and cross-sectional area. Phosphate, Nitrate, Nitrite, and Ammonia concentrations were measured using Chemetrics CHEMets ampoule kits. Dissolved Oxygen and temperature were measured using the YSI ProODO Optical Dissolved Oxygen Meter. Turbidity was measured using the MicroTPW Field Turbidimeter. Water pH was measured using the Oakton pHTestr 20 double junction pH meter. Discharge or flow of Redwine Creek increased downstream from Fiberboard Rd. to Igoe Inn Rd., to Grambling State University, to US80, and peaked at Ansley Rd. Phosphate and Ammonia concentrations at US 80 were elevated beyond proposed water quality impairment levels for EPA's South Central Plains Ecoregion. The US80 location of Redwine Creek also had the highest temperature and lowest Dissolved Oxygen of all the sampled locations, despite having the second highest flow. Results indicate that the location of Redwine Creek at US80 has impaired water quality for phosphate and ammonia, and that the City of Grambling's water treatment plant may need improvements to maintain the water quality that upstream locations show. Further measurements will include presence or absence of fecal coliform bacteria at each location. Abundance of fish species and macroinvertebrates will also be sampled and be related to tolerance to pollution.

## **Invasive Species Along the Rock Island Greenway**

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The Rock Island Greenway, also known as the Chataouqua Run, was named after the railroad that passed through known as The Chicago, Rock Island, and Pacific Railway. Today a portion of this right-of-way is now a local park in Ruston, LA. The park runs North to South along Chataouqua Creek for one mile and has a crushed stone path throughout its entirety. The path is lined with many mature and understory native tree and shrub species, but invasive species have begun to move in. Species such as Chinese privet (*Ligustrum sinense*), Chinese tallow tree (*Triadica sebifera*), chinaberry (*Melia azedarach*), and kudzu (*Pueraria lobate*) have been detected and must be kept to a minimum to preserve the aesthetics and native species composition within the park. This area is being surveyed to find location, density, and species variation among invasive species.

## Determining the Effects of Weaning Methods on Circulating Glucose in Beef Calves

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A major goal of cow-calf producers throughout the world is to minimize stress of their livestock while still optimizing performance of each animal. Weaning is a particularly stressful time for both calves and their dams. Research and years of production in the United States has shown that fenceline weaning (calves and their dams are placed in pastures adjacent to each other) is often less stressful than abrupt weaning (calves are immediately moved to a location separate from their dams). However, there is limited data on which of these weaning methods is most efficient when calves are transported immediately following weaning, a practice that is common to many cow-calf producers who market their freshly weaned calves. Since stress is known to impair the release of insulin, subsequently increasing blood glucose levels, we proposed to assess the correlations between circulating blood glucose with changes in calf weight and calf average daily gain. To do so, *Bos taurus* calves (n=16) were randomly divided into two groups of equal numbers of heifers, bulls, and steers one week prior to weaning. One group was weaned by the fenceline (FL) method and one group was weaned abruptly (AB). On Day -4, calves and their dams were separated into the FL and AB groups; weights and blood from the jugular vein were collected from all calves. The FL calves and their dams were placed in pastures adjacent to each other. The AB calves and their dams were returned to their original pasture. On Day 0, all calves were weighed and blood was collected again. All calves, from both the FL and AB groups, were placed on a trailer (remaining divided into respective groups) and transported for two hours to a new location. At the new location, weights and blood samples were collected immediately. Calves then remained separated into their groups and offered hay and water *ad libitum* for 24 hours. At the end of that 24 hour period (Day 1), calves were reweighed and blood was collected. Each group was then placed in similar pastures with access to the same amount of feed, hay, and water daily. Weights were assessed 28 days post-weaning, with final blood sample also obtained at this time. Following each collection, blood was centrifuged and plasma was stored at -20°C. At the conclusion of the trial, plasma samples were analyzed for glucose concentrations. There was no difference ( $P > 0.05$ ) in calf weight between treatment groups on Day -4, Day 0 pre-transport, Day 0 post-transport, Day 1, or Day 28. Thus, there was no difference ( $P > 0.05$ ) in weight loss from transportation on Day 0. Similarly, blood glucose levels did not differ ( $P > 0.05$ ) between FL and AB weaned calves at Day -4, Day 0 pre-transport, Day 0 post-transport, Day 1, or Day 28. Although this data shows that weaning method does not impact transportation shrinkage in calves, further research is warranted with a larger sample population.

## **Comparison of the effects of mechanical heart valves and bioprosthetic heart valves on patient blood pressure.**

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Various diseases and conditions can lead to patient receiving a heart valve replacement (HVR). Bioprosthetic heart valve replacements (BHVR) encompasses several different classifications of HVR, namely xenografts, allografts, and autografts; Mechanical heart valve replacements (MHVR) include any HVR made from non-organic carbon, metal, or plastic; each option has potential costs and benefits in their implementation for doctors and patients alike. We would like to propose further research into the effects of both forms of replacement on the blood pressure (BP) of patients in an effort to establish a significant difference in the BP of patients that have received a MHVR compared to patients that have received a BHVR given that their exact effects are currently unclear. To conduct such research however many obfuscating variables such as the necessity of blood thinners, the effects of any pre-existing and emerging heart conditions, and other factors must be accounted for prior to taking measurements and establishing any meaningful comparisons between BHVRs' and MHVRs' effects on the human body. The analysis of biomedical literature and other research papers has led to no conclusions on the effect of BHVRs on BP and encourage further research into how they may affect patient health in this regard.

## **Electronic Health Records: The Average Consumer**

Betsy Flowers <sup>1</sup>

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An electronic health record (EHR) is a computerized version of a patient's paper chart or medical record. EHR's contain patient's medical history, diagnoses, medications, treatment plans, immunization dates, allergies, radiology images, and laboratory and test results. To those who know what an EHR is they typically think of them as being used in hospitals or patient portals at the doctor's office. Those who don't know what they are, are usually skeptical about their use and only consider them to be used at hospitals. Electronic health records are so much more than just digitalized versions of patient's health information and are for more than just use by doctors.

## The Efficiency and Effectiveness of Tele-Health

Meredith Nichols<sup>1</sup>

<sup>1</sup>*Health Informatics and Information student.*

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There is a large population of this country that has difficulties receiving proper healthcare simply because of the distance they live away from a medical facility or because of the ongoing complications of their chronic conditions. Technology has been infiltrated into various aspects of healthcare. Due to the increase of technology, it has also begun to play a role in how we communicate with physicians, specifically in the field of Tele-Health. This study demonstrates the effectiveness that Tele-Health has on the populations of patients in rural areas, millennials, patients with chronic conditions, and patients looking for a more convenient way of communicating with their physician. Tele-Health includes a secured access to utilize technology in a way that allows health care providers to "visit" patients via facetime and other sources which enables them to evaluate and diagnose patients despite the distance. The specific use of Tele-Health to provide clinical communications between providers and patients is referred to "Tele-Medicine" while "Tele-Health" includes clinical and nonclinical aspects. Tele-Health offers many services that provide direct benefits to all that are affected which include medication management, follow-up visits, care for chronic conditions, and numerous other opportunities.

Other aspects of Tele-Health include Tele-Emergency, Tele-ICU, and Tele-Pharmacy. The use of Tele-Health gives facilities a competitive advantage over facilities which did not because to the convenient access to care that the patients can now receive, which can also lead to lower readmission rates. I conducted my research through medical journals posted on the AHIMA website and the National Library of Medicine. Based on the results from these articles, I formulated a theoretical scenario on how Tele-Health would improve healthcare specifically in North Louisiana.



## **Health Information Systems: Improvements in Healthcare**

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Health information systems have been emerging rapidly since the development of electronic health records. Electronic health records, EHR, have allowed physicians and nurses to input patient medical data into a computer system which makes the information quicker and easier to find. Other health information systems such as E-prescribing, Snomed CT, and RxNorm have also helped to increased productivity in the medical world. Improving healthcare has been an ongoing issue for many years. The importance of reducing error and improving the quality of health care will never cease to exist. Since technology is a major part of today's time, it only makes sense to incorporate it into the medical field. With the rise of new technology, there are always skeptics. Many find it difficult to trust something that they do not understand. As with anything new, there will be trial and error; unfortunately, there is little room for mistakes in the medical field.

## **Biometric Healthcare**

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The concept of biometrics in healthcare is a relatively revolutionary idea whose application has brought major improvements in treatment outcomes. Alongside other concepts, biometrics has made the healthcare industry to become one of the most promising sectors today. Most countries, particularly the highly industrialized ones, continue to invest heavily in this sector to ensure citizens have enough drugs and medical equipment to fight off various diseases. This spending has increased to about 10% of global gross domestic product (GDP) (Papanicolaou, Weskie & Jha, 2018). Biometrics remain one of the best scientific-based techniques in to the health sector. This paper attempts seeks to explore past literature to determine how biometrics help in healthcare and the problems it can solve. It also looks at the connection between biometrics and information management.

## **A predictive modeling framework for studying disparities in colorectal cancer incidence**

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Colorectal cancer (CRC) is the second leading cause for cancer related deaths in United States and it is imperative to determine the consequences leading to the deaths. Studies have also identified gender as a key cause of disparity with males being more at risk when compared to the females. Colonoscopies performed as a screening for CRC are both a useful diagnostic tool, and an important prophylactic, as precancerous polyps are generally removed during the procedure. They also allow for diagnosis in earlier stages, significantly increasing survival chances. In our work, given the data-set containing diagnosis/procedure codes and demographic data of over a million patients we explored for patterns that may aid in future screenings. The study was focused on the racial, gender, and age disparities in CRC diagnosis. To that end, we have also begun analysis of those in the data-set who had been given colonoscopies prior to (or as the means of) their diagnosis, as well as survival modeling, given the dates of their entry to (representing either routine screenings or referral) and exit from the data (representing either death, a second opinion, or remission). Our initial results show that males are typically diagnosed earlier and at a slightly higher rate than females, and yet, females had a consistently higher survival probability, while African Americans of both genders had a slightly higher chance of diagnosis.

## **Bark Beetle Influence on Diversity of Leaf Litter Communities**

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Bark beetles kill trees and transfer bluestain fungi. Bluestain fungi attracts termites, which can affect decomposer community structure. We tested the hypothesis that leaf litter communities below bark beetle attacked wood would differ from those below unattacked wood. Diversity was higher in BB attacked communities, and where termites were present, but there was no difference in community structure. Thus, bark beetles can influence decomposition processes through indirect interactions with termites.

# Determining the Effects of Prescribed Burning on Water Quality and Soil Chemistry in a Shortleaf Pine Restoration Forest

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The objective of this proposal is to determine whether water quality and soil chemistry are impacted by prescribed burning in a shortleaf pine restoration area. The Upper West Gulf Coastal Plain was historically maintained with wildfire but now requires human intervention. Prescribed burning is an important management practice for fire-adapted species like shortleaf pine (*Pinus echinata*) in areas that are unnaturally dominated by loblolly pine (*Pinus taeda*). Prescribed burns promote growth of understory vegetation that support important forest insects like pollinators and decomposers. Decomposition is essential for providing nutrients to support plant growth, but the effects of burning on decomposition is lacking. Thus, prescribed burning in shortleaf pine forest ecosystems can support increased biodiversity. However, burning can also increase erosion rates that can increase sediments, nutrients, and other types of pollutants leaching into streams. These depositions have the potential to either reduce water quality or provide beneficial nutrient subsidies for aquatic ecosystems. We will test the hypothesis that prescribed burning impacts stream quality, soil chemistry and leaf litter decomposition rates on Wafer Creek Ranch, Louisiana. We predict increased carbon and other nutrients in streams following fires that may impact streams both on the short- and long-term. We also predict leaf litter decomposition rates immediately after this prescribed burn will be lower in burned than unburned areas, but will be greater on burned areas in the long-term as burning typically increases soil nutrients. To determine how burning in a short leaf pine restoration forest impacts belowground processes and stream quality, we measured decomposition, soil and stream nutrients, stream flow, and stream conductivity in Wafer Creek Ranch on areas of 1) Shortleaf Pine Restoration + Burn and 2) No restoration (e.g., Loblolly Pine) without Burn by measuring these processes pre-burn and immediately after. From preliminary samples of decomposition rates in filter paper, we saw an average mass loss of 23.21% in no restoration areas and 12.80% in restored areas. For the future of this research, stream invertebrates and terrestrial invertebrates will be sorted and identified to further understand the ecological implications of a prescribed burn. This research will help inform management strategies of shortleaf pine restoration projects in the ecoregion that are transforming agriculturally damaged and fire suppressed lands to their native vegetative species composition.

## **Effects of Low-Level Salt Additions on Plant Growth and Implications for Riparian Detrital Processing**

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Riparian systems are important buffer zones between terrestrial and stream systems that filter nutrients and mediate stream health and inputs. Riparian plants are a major factor in a riparian zone's ability to filter these nutrients and dead leaves (detritus) provide energy input to both riparian and stream systems. Human activity is increasing salts like NaCl in riparian and freshwater systems. Sodium (Na) is toxic to most plants, and an overaccumulation of Na can lead to reduced plant growth or death. However, previous research indicates plants accumulate salts when soil salinization increases. We want to determine how much salt is taken up by plants, where plants store salt, and what impacts salt has on plant growth. We hypothesize that plants that receive low-level salt additions will uptake store salt. We predict that plants will store most of the salt in leaves, which can alter detrital food quality. And finally, we predict that plants will have reduced growth compared to plants without salt additions, which can alter a riparian zone's ability to filter nutrients. To test our hypotheses, set up a greenhouse experiment using the plant species *Brassica oleracea*. We potted twenty plants, with half watered with salt water and the other half watered with DI water. Each plant was watered weekly with 300mL of DI water and 0.15g (500mg L<sup>-1</sup>) of salt added to each of the salt plants. Initial plant Na content was measured and senesced leaves from each plant are collected weekly. Plants have been treated for about three months of this six month experiment. At the end of six months, each of the plants will be separated by leaves, stems, and roots and sent to a lab for chemical analysis, along with soil from each of the pots. Senescent leaves collected weekly will be chemically analyzed. If senesced leaves have higher Na content under low-level salination, detrital food quality will be altered. This can lead to adverse impacts on riparian zones.

# Demographic Responses to Pleistocene Climate Change in Interior Highlands Woodland Salamanders (Genus *Plethodon*)

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The Pleistocene (~2.5 million to 12,000 years ago) was characterized by climate fluctuations and glacial cycles, which greatly impacted many species' distributions. Changes in population size associated with range expansion and contraction are expected to leave specific genetic signatures in populations. Closely related species occupying the same geographic area might be expected to respond similarly to climate fluctuations; however, growing evidence suggests that species often respond uniquely to environmental changes. The Interior Highlands (Ouachita Mountains and Ozark Plateau) are home to several species of plethodontid salamanders and experienced significant environmental changes throughout the Pleistocene. We used mitochondrial DNA sequences from seven species of Woodland Salamanders (Genus *Plethodon*) occurring in the Interior Highlands to test if species showed similar changes in effective population size ( $N_e$ ) in response to Pleistocene climate change. We found that several species showed evidence of a recent increase in population size, likely as a result of range expansion following the retreat of glacial ice sheets after the Last Glacial Maximum. However, other species showed evidence of stable or slightly decreasing population size. Although some species appeared to have similar demographic responses to Pleistocene climate change, our results support the idea that species, even those closely related, will respond individually to environmental changes.

## **Genetic Evidence for Two New Species of Salamanders (*Plethodon glutinosus* complex)**

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The 16 species of Slimy Salamanders (*Plethodon glutinosus* complex) are distributed throughout the eastern United States and show little to no morphological variation, having been described primarily using genetic data. Four species are known to occur west of the Mississippi River in Arkansas, Missouri, Oklahoma, Louisiana, and Texas, but our knowledge of species diversity and distributions in this region is based on genetic analysis of only 19 populations. Some of these species have small geographic ranges and many areas have not been sampled, meaning that additional species may remain to be discovered. To better understand species diversity in this region, we collected salamander tissue samples from >200 localities and sequenced the mitochondrial ND2 gene. Phylogeographic analysis revealed two distinct groups of populations in southwestern Arkansas and extreme southeastern Oklahoma that do not align with any known species. Thus, our results indicate that two undescribed cryptic species are present and additional species diversity exists in the *Plethodon glutinosus* complex. Future work will incorporate genetic data from the nuclear genome and examine morphological variation to determine whether formal descriptions of new species are warranted.



## Historical Biogeography of the Western Slimy Salamander (*Plethodon albagula*)

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The Interior Highlands in Arkansas, Missouri, and Oklahoma are composed of two sections, the Ouachita Mountains and Ozark Plateau, both of which harbor a high diversity of plants and animals. The Ozarks are bordered by the Missouri River to the north and are separated from the Ouachitas to the south by the Arkansas River. Previous work on plethodontid salamanders found that historical dispersals between the Ouachitas and Ozarks have been rare despite their geographic proximity and suggested that the Arkansas River and its floodplain are a barrier to dispersal. The Western Slimy Salamander (*Plethodon albagula*) was one of the few species that was inferred to have dispersed across the Arkansas River from the Ouachitas to the Ozarks; however, they were unable to distinguish between a single dispersal event or multiple independent dispersals because of limited sampling. To resolve this question, we sequenced the mitochondrial ND2 gene for *P. albagula* from 176 populations throughout their distribution and constructed a phylogenetic tree. We then used historical biogeographic methods to infer the number of dispersals between the Ouachitas and Ozarks. Additionally, because *P. albagula* occurs north of the Missouri River in the northern part of its range, we also inferred the number of dispersals across the Missouri River. Our analyses indicated that *P. albagula* has dispersed across the Arkansas River four times from the Ouachitas to the Ozarks and zero times in the reverse direction. We found evidence for four northward dispersals across the Missouri River. Our study shows that large rivers, which appear to function as strong barriers to other plethodontid salamanders, are more permeable to *P. albagula*. Better dispersal ability and broader environmental tolerance may explain why *P. albagula* has come to occupy a large geographic range despite the presence of large rivers whereas other closely related species in the Interior Highlands have not.

## Effects of Leaf Diversity on Tannin Concentration and Water Quality

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Most trees leaves contain chemicals called tannins, which vary by species. Tannins are used by trees as a defence mechanism against herbivory and plant pathogens. When trees shed their leaves, tannins are left in the leaves and can leach into freshwater ecosystems, where they can have adverse effects on tadpoles. This project has been conducted to look into the effects different mixtures of leaves have on tannin concentration and dissolved oxygen concentration. We hypothesize that the different leaf combinations will change the tannin concentration relative to the tannin concentrations of single leaf species. We tested this using three leaf diversity levels, including one, two, and four species. We used different combinations of species for each diversity level drawn from a species pool of 6 species to prevent bias from species composition. In the mixtures of four leaf species, we saw a reduction in oxygen concentration when compared to water with single species. This indicates that characteristics of different leaf species may interact to alter water quality.

## Effects of Leaf Tannin Concentration on Aquatic Beetle Colonization

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Tannins are organic secondary compounds stored in leaves. They protect plants from disease and herbivory. As leaf litter decomposes, tannins can leach into and accumulate in aquatic systems. This could have a significant impact on aquatic organisms, especially those that rely on ephemeral bodies of water for reproduction, shelter, and/or food. Amphibians are believed to be highly susceptible to tannins, with high tannin concentrations having been found to have deleterious effects on tadpoles. Currently, little information exists on the effects of tannins on aquatic invertebrates. This study aimed to investigate the relationship between tannin concentration and habitat selection in aquatic beetles. 80-grams of leaves from 15 tree species were collected (3 per species, 45 total) from different locations in Lincoln Parish, LA. 45 wading pools were set up at LA Tech's South Campus. Each pool contained leaf litter from one of the 15 tree species. Beetles were collected from the pools every 3 to 4 days over the course of 3 weeks during May 2018. Over the course of the experiment, water samples were taken three times for tannin concentration analysis. Beetles were identified to species. Regression was used to examine the relationship between tannin concentration with colonizing beetle abundance. Total beetle abundance, *Copelatus glyphicus* abundance, and *Laccophilus fasciatus* abundance were positively correlated with tannin concentration. Tannin concentration had no effect on total *Enochrus* abundance. Overall, beetles preferred the Chinese Tallow leaves. This preference may prove maladaptive, as tannins have been found to negatively impact some terrestrial species of invertebrates. Members of the genus *Enochrus* showed no significant preference for either tannin-rich or tannin-poor pools. Our results suggest that aquatic beetles may significantly vary in tannin tolerance.

## Effects of Freshwater Microorganisms on the Degradation of Tannins

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Tannins are a group of compounds called polyphenols that bind to proteins. Tannins are plant's natural defense against insects as they are toxic to many insect and animal species if ingested. When tannins are present in a body of water, they reduce the level of dissolved oxygen, which can be detrimental to many native species in ponds, lakes, and streams. Microbial degradation of tannins has been found mainly in the guts of species that naturally feed on leaves of plants with high tannin levels, such as the koala bear. Our research objective was to determine if the microorganisms present in freshwater systems increase the rate of tannin degradation. If so, this would suggest that bacteria capable of breaking down tannins are present in the water. We tested this by examining the change in water tannin concentration and dissolved oxygen over a two-week period for five different treatments: tap water, unfiltered pond water, and water filtered with glass fiber filters with different pore sizes, including 2.7, 1.6, and 0.7 microns. Microbial cells can range from 0.2 to 10 microns in size which is why we chose various pore sizes for our treatments. This variance in pore size will allow us to control of the proportions and size of bacteria that are in the solutions. All treatments were replicated four times. We added dissolved tannic acid to achieve an initial concentration of 8mg/L tannins in each replicate. We also included two tap water replicates with no tannic acid added to serve as controls. Water samples and dissolved oxygen measurements were taken every 2-3 days for two weeks, and tannin levels were measured in each water sample using a spectrophotometer.

## **Assessing the Current Status and Distribution of Crawfish Frogs in Louisiana**

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One-third of amphibian species globally are experiencing population declines due to habitat alteration, environmental contaminants, UV-B irradiation, disease, introduced species, exploitation, and climate change. The crawfish frog (*Lithobates areolatus*) has disappeared throughout much of its range due to destruction of its habitat, primarily via conversion to agriculture. In Louisiana, most records of crawfish frogs are from prior to the 1970s, and more recently the species has been documented at just one location in Caddo Parish. Our objective is to determine the current status and distribution of crawfish frogs in Louisiana. We are conducting nighttime call surveys along roads near historic locations where potentially suitable habitat still remains. We will also deploy automated audio recording devices (i.e., FrogLoggers) in areas with appropriate breeding habitat in state wildlife management areas and national wildlife refuges. If we locate several crawfish frog populations, we will measure a suite of habitat variables and model occupancy. We will also test for associations between detection and climatic variables such as temperature, humidity, wind speed, and rainfall. Results from this research will be crucial to determine if crawfish frogs persist in Louisiana, and if so, will provide valuable data to inform future habitat conservation and reintroduction efforts.

## Characterization of CotJC Spore Protein in *Bacillus anthracis*

Morgan Nall<sup>1</sup>, Josh Samuel, Rebecca Giorno<sup>2</sup>

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*Bacillus anthracis* is a spore forming bacteria that is responsible for anthrax disease. We are interested in the roles of the outermost layers, the coat, interspace, and exosporium, with respect to resistance and germination. Previously, we have shown that *cotH* spores germinate more completely than wild-type (WT). We have also shown that *cotH* mutant spores are missing proteins in addition to CotH. One of these possible CotH assembly-dependent proteins is CotJC. We have constructed a strain of *B. anthracis* that expresses green fluorescent protein attached to CotJC (CotJC-GFP). We monitored the expression and assembly of CotJC-GFP in both WT and *cotH* backgrounds. Fluorescent microscopic examination of spores suggests that CotJC-GFP assembly is CotH dependent. We are currently in the process of constructing a marker-less *cotJC* deletion in *B. anthracis*. Once isolated, we will measure the germination rates of the WT, *cotH*, and *cotJC* mutant spores. Our goal is to clarify if CotJC contributes to the *cotH* mutant enhanced germination phenotype.

## Is Heat Activation of *Bacillus anthracis* spores Reversible?

Nathan Ross<sup>1</sup>, Anusha Elumalai<sup>2</sup>, Rebecca Giorno<sup>3</sup>.

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**Background:** Bacteria of the *Bacillus* genera are capable of forming dormant and resilient cells called spores in response to starvation. These dormant spores can be reactivated in the presence of nutrients in a process called germination. Historically, spores are exposed to sublethal heat treatments to increase the extent and rate of germination. This process is known as heat activation (HA). HA reduces  $T_{lag}$ , the time between the addition of germinant to the rapid release of  $Ca^{2+}$  and dipicolinic acid (Ca-DPA) from the spore core, and increases the percentage of spore germination. This release of Ca-DPA initiates germination, and optical density loss follows. Previous studies on *Bacillus* species indicate that the effects of HA are reversible after 72 hours. After this time period, the spores must be reactivated. However, recent experiments by our lab suggest that this might not be the case for *Bacillus anthracis* spores.

**Methods:** *B. anthracis* spores were prepared by exhaustion in DSM and extensively water washed. Each sporulation was split into 3 samples: no heat treatment, heat activated on day one of the experiment (HA1) and activation on the particular day relative to day 1 (HAN). Spores were heated at 65°C for 30 minutes, cooled on ice for 15 minutes, and warmed to room temperature. Germination is initiated with 1mM Alanine and 1mM Inosine. Germination was measured by the loss of optical density at 580nm ( $OD_{580}$ ). The assays were performed on days 1, 3, 5, 7, and 14.

**Results:** As expected, heat activation had an impact on spore germination. The preliminary data shows that, over a period of seven days, heat activated spores had reduced  $T_{lag}$  and an increase in the final percent germination over non-activated spores. We are in the process of repeating this experiment to determine if the storage conditions of the spores impact these results.

**Conclusions:** Our data suggests that heat activation may impact spores longer than originally expected. This may have broader impacts on our understanding of heat activation.

## **Role of spore-associated inosine-uridine nucleoside hydrolase IunA in *Bacillus anthracis* spores**

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*Bacillus anthracis* spores are the infective particle in anthrax disease. The three outer layers of the spore that we study (exosporium, interspace, and coat) are involved in germination which influence our ability to decontaminate environments safely. A combination of two germinants, a nucleoside and an amino acid, trigger germination in *B. anthracis*. The metabolically inactive spores contain enzymes, one of which, called inosine-uridine-preferring nucleoside hydrolase (IunH), breaks down the cogerminant inosine into D-ribose and hypoxanthine. A putative inosine-uridine nucleoside hydrolase, IunA, has been identified and its impact, along with IunH, on germination and spore associated inosine hydrolase activity was studied. Spore-associated inosine hydrolase activity and germination kinetics were measured in wild-type, *iunA*, and *iunH* mutant spores and compared. *iunH* mutant spores lack hydrolase activity while the *iunA* mutant spores have reduced activity. Preliminary data suggests both *iunH* and *iunA* mutant spores have an enhanced germination rate compared to wild-type. The results show that IunA does have an impact on spore-associated inosine hydrolase activity and spore germination, but to a lesser extent than IunH. *iunA* mutant spores have an exosporium assembly defect. Given that IunH is also an exosporium protein, it is unclear if the resulting *iunA* phenotypes are due to the absence of IunA or improper assembly of other exosporium proteins such as IunH. Clarifying the role of IunA as either an enzyme or structural protein will affect future studies related to identifying inosine-uridine hydrolase inhibitors that may help to design better therapeutics and decontamination strategies.



## Comparing the Impact of Heat Activation and Ammonium Chloride on the Germination of *Bacillus anthracis* Spores

Declan Tracy<sup>1</sup>, Logan Arceneaux<sup>1</sup>, Holly Hargis<sup>1</sup>, Blake Roberson<sup>1</sup>, Alika Shum<sup>1</sup>, Ashley Waldrop<sup>1</sup>, and Rebecca Giorno<sup>2</sup>

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*Bacillus anthracis* is a gram-positive spore-forming bacteria that is the causative agent of anthrax. Spores of many *Bacillus* species have been shown to germinate poorly unless first activated by one of a variety of treatments. Previous research conducted in *Bacillus cereus* spores has shown that the addition of ammonium chloride (NH<sub>4</sub>Cl) can enhance germination. Because *B. anthracis* and *B. cereus* are closely related, we wondered if the same effects would be seen in *B. anthracis* spores. We conducted a series of germination assays in *B. anthracis* spores from the ΔSterne strain in the presence and absence of 40mM NH<sub>4</sub>Cl both with and without heat activation. Spores were germinated in a reaction mixture consisting of 1mM Alanine, 1mM Inosine, and 20mM Tris-HCl pH 7.5 in the presence or absence of NH<sub>4</sub>Cl. Initial results indicate that germination is enhanced by NH<sub>4</sub>Cl in both heated and unheated spores. Previous reports suggest that heat activation is necessary to achieve optimal germination rates; however, our initial results indicate that NH<sub>4</sub>Cl alone can greatly enhance germination. We are currently in the process of testing the impact of NH<sub>4</sub>Cl on the germination rates of spores from Sterne strain. Our preliminary data suggest that robust germination efficiencies can be achieved by adding NH<sub>4</sub>Cl to germination reactions. By eliminating the need for heat activation, the use of NH<sub>4</sub>Cl could simplify large-scale decontamination strategies, making them safer and more cost-effective.

## Effect of high-energy radiation on the formation of 8-hydroxy-deoxyguanosine

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Reactive oxygen species (ROS) cause mutation of the DNA bases, which is implicated in carcinogenesis and variety of age-related disorders. 8-hydroxy 2'-deoxyguanine (8-OHdG) is a modified form of the guanine base that forms due to cellular exposure to ROS and is used as a biomarker for oxidative stress. Clinical radiation treatments expose cells to high levels of ROS, leading to an accelerated accumulation of 8-OHdG mutation. The objective of this study is to investigate the effect of high energy radiation on the rate of 8-OHdG formation in a human astrocytes. An enzyme-linked immunosorbent assay (ELISA) was performed in plate reader equipped with absorbance detection was used to quantify the level of 8-OHdG accumulation in cells treated with 0.5 Gy and 3 Gy proton and photon radiation to compare with normal, untreated cells. Reverse transcription quantitative PCR (RT-qPCR) analysis was applied to assess the mRNA expression levels of 8-oxoguanine glycosylase (OGG1) in both the treated and non-treated cells. OGG1 is an enzyme of the base excision repair pathway that main function is to remove 8-OHdG mutation. Decreased levels of OGG1 expression correlates with increased accumulation of 8-OHdG which leads to an increased level of cellular damage. In this study, human astrocytes were cultured and transported to Willis-Knighton Cancer Center in Shreveport for radiation treatment with 0.5 Gy and 3 Gy proton and photon radiation. The cells were incubated for 14 hours in humidity incubator and the analyzed. Cell media was collected and the concentration of oxidative damage by-product was analyzed using ELISA, with the results showing a steady increase of 8-OHdG accumulation as with the increased radiation dosage. The cells were lysed and RNA was purified using Qiagen total RNA purification kit. The results of this analysis reveal a strong trend of decreased levels of OGG1 expression as radiation dosage increased.

## **Identification of miRNA-OGG1 mRNA interactions: small RNA sequencing and immunoprecipitation analysis**

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Reactive oxygen species induce modifications of the DNA bases that are implicated in cancer development and progression as well as aging and age-related neurological disorders. The base excision repair mechanism had evolved to repair the mutations induced by oxygen radicals. The objective of this study is to identify novel microRNAs that regulate the expression of 8-oxoguanine glycosylase (OGG1), an enzyme that plays an important role in the DNA base excision repair pathway. Altered expression of OGG1 leads to accumulation of modified bases, DNA damage, and increased rate of nucleic acid mutation. To simulate conditions of oxidative stress, human astrocytes were treated for 16 hours with 10 $\mu$ M sodium dichromate. OGG1 mRNA and protein expression levels were assessed via RT-qPCR and protein simple Wes® assay. RNA extracted from treated and non-treated cells was sequenced using Ion Proton small RNA sequencing platform. OGG1 mRNA and protein expression levels were significantly reduced after treatment with sodium dichromate. MicroRNA sequencing revealed that large numbers of microRNAs are upregulated following treatment with sodium dichromate. Bioinformatics analysis was implemented to identify potential microRNAs that bind to the 3'UTR region of the OGG1 mRNA gene, which includes miR-20b, miR-33, miR-let7, miR-103, and miR-491. The most statistically significant microRNA candidate, miR-103 was further employed in immunoprecipitation studies using the MirTrap System. Co-transfection of astrocytes with miR-103 mimic and the pMirTrap vector resulted in co-immunoprecipitation of miR-103–OGG1 complex which was validated by qRT-PCR, with an OGG1 mRNA fold enrichment of up to 7.

## Inserting a His tag on GFP

Abigail Bass<sup>1</sup>, Patrick L. Hindmarsh<sup>2</sup>

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Many experiments involving proteins that rely on in vivo results are limited to observational and kinetic tools. We are interested in combining in vivo and in vitro experiments using a reactive oxygen specie's sensitive green fluorescent protein (royGFP). Isolated proteins can be used in specific kinetic assays without the complications of cellular proteins and molecules. To do these experiments, royGFP is to be isolated from all other cellular proteins. The easiest and well-established method is adding a histidine or 6 His tag to the N-terminus of royGFP. The His-tagged protein contains a positive charge and the entire contents of the cell can be passed over a negatively charged nickel column, allowing only proteins with the positive charge to be retained and separated from the rest of the cellular proteins. The expressed His-tagged protein's string of histidine binds to the metal ions in the nickel column, letting the protein to be purified and detected easily. Nickel provides good binding efficiency to the His-tagged protein, but it can also attract other positively charged materials as well. The amount of extra non-targeted material should be a small amount, thus not interfering much with the results. However, to ensure that the non-targeted material does not interfere, a method known as the Western Blot may be implicated. The method involves transferring the acquired protein and extra material onto a gel where they can be visualized specifically, thus allowing the His-tagged protein to be studied individually.

## Optimization of GFP Biosensor

Drake Heinz<sup>1</sup>, Patrick L. Hindmarsh<sup>2</sup>

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Advances in medical therapies has advanced significantly in the last 25 years with the exception of those targeting microorganisms. The developments in antibiotics in the first half of the 20th century was very robust, but selective pressures have enriched bacterial populations for resistance. In order for the scientific community to maintain the ability to keep pathogens in control depends on the development of new and novel antibiotics. For my project I am developing a reactive oxygen species (ROS) sensitive green fluorescent protein (GFP) that can be expressed in *E. coli* and *Candida albicans*. My system will be able to identify novel antibiotic and antifungal compounds. The question I would like to answer is whether I can develop a ROS-sensitive GFP that has increased specificity to ROS by eliminating cysteines unrelated to our experimental design. This biosensor utilizes changes to two proximal amino acids to cysteines (S147C and Q204C) made using Quik-change mutagenesis. Mass spectroscopy and sequencing will check if the mutation occurred correctly. In the presence of ROS, these two cysteines form a disulfide bridge distorting the excitation of GFP. We can detect this using the clear bottom plates and the plate reader to see if there is a gain or loss of fluorescence. The percent change in fluorescence can show the presence of ROS. In addition to these mutations, there are two natural cysteines at positions 48 and 70 in GFP that under an oxidizing environment will form disulfide bridges with other proteins, complicating the analysis of our biosensor. Several groups have altered these cysteines to different amino acids in order to eliminate the oligomerization of GFP. Unfortunately, some of the amino acid substitutions have shown negative affects on the fluorescence (1). The goal of this project is to replace these two natural cysteines while maintaining the fluorescence of GFP. Alanine and serine substitutions have been shown to decrease fluorescence, while hydrophobic substitutions, valine and isoleucine, have been suggested to maintain fluorescence (2). In addition to valine and isoleucine, we will introduce leucine, methionine and phenylalanine. I will use combinations of these amino acids to mutate positions 48 and 70 and test these using a fluorescence plate reader to identify mutants that maintain wild type fluorescence followed by testing under oxidizing conditions using western blot analysis to detect oligomerization. With a functional ROS-sensitive GFP biosensor, novel antibiotics can be identified that can be used properly without increasing ROS. Furthermore, this biosensor can be widely used at discovering other molecules in the cells that also increase ROS.

## **Creating a Fast-Folder ROS-sensitive GFP and a Super-Fast ROS-Sensitive GFP**

Douglas Ferrell<sup>1</sup>, Patrick L. Hindmarsh<sup>2</sup>

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Our lab has developed a reactive oxygen species sensitive green fluorescent protein (royGFP). This biosensor can be utilized to detect the effectiveness and biochemical pathways of novel antibiotics and antifungals. However, royGFP suffers from oligomerization within some of the major organelles, due to two wildtype cysteines forming disulfide bridges with other GFP proteins. By researching scientific articles, it became apparent how Fast-Folder GFP and Super-Fast Folder GFP (sfGFP) may bypass these problematic residues. Therefore, my goal for this project will be to develop fast folder and super fast folder and ROS variants of these two GFPs. We began our process by using yeast enhanced GFP (yEGFP) as our initial template. By inserting five mutations, F99S, M153T, V163A, F64L, and G65T via Quikchange, we created Fast Folder GFP (ffGFP). We conducted minipreps in between each mutation and after completing this set of five mutations, we then began synthesizing Super-Fast folder GFP, this was done by adding S30R, Y39N, N105T, Y145F, I171V, and A206V to our ffGFP. By adding the S147C and Q204C to both ffGFP and sfGFP, we synthesized two new ROS-sensitive GFPs. Our results show fast-folder GFP to have increase intensity, due to the uniform intensity and brightness in comparison to yEGFP and royGFP. By creating these two versions, it may be possible to accurately quantify the production and damage of ROS being produced by antibiotics and antifungals.

## **Testing ROS Sensitive Green Fluorescent Protein Using Secondary Metabolic Products From Different Species of Bacteria**

Johnathon Wong<sup>1</sup>, Patrick L. Hindmarsh<sup>2</sup>

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Reactive Oxygen Species (ROS) are known to be a natural byproduct of metabolism and are generated in response to certain antibiotics. The ultimate goal of this project is to develop a bio-sensor that can detect ROS production by bacteria in the presence of antibiotics. I am currently investigating whether spent media generates ROS. Competition between microorganisms for various resources such as nutrients and space has been well documented. Whether it is in different bacterial species or in bacteria or eukaryotic cells, this competition is pervasive. One method in which these cells compete is through the secretion of secondary metabolites that can either inhibit the growth or kill target cells. These metabolites are dispersed in the cell media and can be isolated through centrifugation and filtration of the supernatant. The media that contains these metabolites but not the cells themselves is known as spent or conditioned media. Prior investigations suggest that this spent media can potentially impede cell growth. I am interested in whether spent media from specific species of bacteria can inhibit bacteria and if so, if these effects can be detected. We have modified a yeast enhanced Green Fluorescent Protein (yeGFP) to be ROS sensitive. Using site directed mutagenesis, we introduced point mutations S147C and Q204C to thus allow us to discern in vitro antibiotic activity by measuring the levels of ROS. I am currently investigating the ROS production by using spent media, or media that has had its nutrients used up by specific species of bacteria such as *B. cereus*, *S. marcescens*, *P. aeruginosa*, *K. pneumoniae* and *S. aureus* generates in *E. coli* cells as a potential method to screen antibiotics that do not naturally induce stress. Applying this novel technique, we ultimately plan to develop a small molecular library and thus shine a new light on the development of new antibiotics

## **Development of a Fast Folder and Super Fast Folder Blue Fluorescent Protein**

Steven Carlson<sup>1</sup> Patrick L. Hindmarsh<sup>2</sup>

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Fluorescent molecules are molecules that are photo luminescent from the molecule absorbing a specific excitation frequency while releasing a defined emission frequency. In order for a fluorescent protein to fluoresce, it must be properly folded. Expression of green fluorescent protein (GFP) does not efficiently fold in bacterial cells as determined by the high variability of the fluorescence intensity from cell to cell. The recent development of fast folder and super fast folder GFP have increased the number of cells with an high level of fluorescence. Our lab has recently developed a fast folder yeast enhanced GFP that can be expressed in *Candida albicans* and *E. coli*. There is a library of fluorescent proteins based on GFP including; blue fluorescent protein (BFP), enhanced blue fluorescent protein (EBFP), yellow fluorescent protein (YFP) and red fluorescent protein (RFP). Conversion of GFP to other fluorescent proteins is dependent on specific amino acid changes. My project is to develop a fast folder BFP (ffBFP) and a fast folder enhanced BFP (ffEBFP). A single amino acid substitution at position 66 (Y66H) converts GFP to BFP and has different excitation and emission spectrums (485 nm/525 nm vs 382 nm/459 nm). These differences are easily detectable but BFP is one of the weakest fluorescing proteins, so one of the aspects of this project is to determine if a ffBFP has an increase in fluorescence. In addition I will be introducing substitutions to convert ffBFP to ffEBFP (Y66H, F64L, S65T and Y145F). Once these are completed I will test these using a fluorescence plate reader at 37°C and various temperatures to test the stability of the fast folder proteins as one of the properties of fast folder fluorescent proteins is thermal stability. Once the super fast folder GFP has been completed in our lab I will produce sfBFP and sfEBFP.



## Testing Green Fluorescent Protein at Different Temperatures and its Relation to ROS Production

Lauren Cox<sup>1</sup> Patrick L. Hindmarsh<sup>2</sup>

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Testing Green Fluorescent Protein at Different Temperatures and its Relation to ROS Production Lauren Cox<sup>1</sup> Patrick L. Hindmarsh<sup>2</sup> <sup>1</sup>School of Biological Sciences, Louisiana Tech University <sup>2</sup>Associate Professor, School of Biological Sciences, Louisiana Tech University Microorganisms or multicellular organisms respond to stress in different ways depending on the type of stress, such as: temperature, infection, environmental factors, and cancer. These different stressors can all contribute to production of reactive oxygen species (ROS). Temperature is a critical stressor that microorganisms are constantly exposed to and must respond. Our lab has developed a ROS sensitive yeast enhanced green fluorescent protein (royGFP). Two substitutions in GFP result in royGFP; introduction of cystines at positions 147 and 204, (S147C and Q204C). These mutations make it possible to measure the production of ROS by the change in fluorescent excitation. In the presence of ROS agents we have observed changes in excitation confirming the functionality of our royGFP construct. In the presence of ROS a disulfide bond is formed between the introduced cystines and this distorts the structure of GFP changing the excitation wavelength from 485 nm in the absence of ROS to 400 nm in its presence. For my experiments I have used a fluorescent plate reader that can maintain different temperatures E. coli cells expressing royGFP and our wild type yEGFP. The temperatures range from physiological temperatures for E. coli (37 to 42oC) and beyond at 45oC.

# Determining Expression Levels of the Notch Signaling Pathway in Self-Renewing hASCs

John Bradley Cart<sup>1</sup>, Avery Bryan<sup>1</sup>, Chris Miller<sup>2</sup>, Dr. Jamie Newman<sup>3</sup>

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Human adipose-derived stem cells (hASCs) have immense potential for regenerative medicine. They can potentially differentiate to form bone, muscle, or cartilage tissue making them very promising in combating degenerative diseases. One of the key elements for maximizing the clinical usage of these cells is determining mechanisms that determine cell fate. The Notch signaling pathway is highly conserved across multiple species and is made up of 4 receptors (Notch 1,2,3, and 4) and 5 ligands (Jag1, Jag2, Dll1, Dll3, and Dll4) each performing an important role in the process of cellular homeostasis and differentiation. Although this pathway is known to be significant in hASC differentiation, very little is known about the role of each receptor and how they work together to maintain and direct cell state. If hASCs are to be used in a clinical setting, then the Notch pathway must be fully understood. We investigate this pathway by determining the expression levels of each of its receptors and ligands. This allows us to piece together how the pathway works by determining how involved these proteins are in the Notch pathway. We further investigate the mechanism of this pathway by performing an siRNA mediated knock-down of Notch 3, a protein which has been determined to play a key role in the pathway. The siRNA will interrupt the translation of the Notch 3 gene from mRNA to protein which will lead to reduced expression of Notch 3. We will then look at the expression of other components of the Notch pathway. If there is a change in expression level in a protein after the Notch 3 knock-down, then there is likely a connection between that protein and Notch 3. By piecing together all of this information, we can begin to get a complete picture of the mechanisms driving the Notch signaling pathway. Once this pathway is understood, it could lead to the development of treatments for degenerative diseases using hASCs.

## **Investigating the Role of MED12, Notch1, and Notch3 Interactions in the Self-Renewal and Adipogenesis of hASCs and their Integrated use in Public Educational Materials**

Rebecca Hodnett<sup>1</sup>, Dr. Jamie Newman<sup>2</sup>

<sup>1</sup>*Biological Sciences, Louisiana Tech University*

<sup>2</sup>*Assistant Professor, Biological Sciences, Louisiana Tech University*

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Adult stem cells offer significant therapeutic potential but in order to harness their medically relevant properties more basic science must be performed. Cell state and differentiation of stem cells is determined by the interaction of signaling pathways, chromatin modifiers, and transcription factors working together to regulate cell-type specific gene expression profiles. I am currently investigating the role of Notch signaling and transcriptional cofactor, MED12, to better understand the relationship between various regulatory mechanisms that determine cell fate. The MED12 subunit of the Mediator complex and the Notch signaling pathway are both known to influence hASC self-renewal and adipogenesis. We will investigate the physical relationship between MED12 and Notch1 and Notch3 intracellular domains as well as use siRNA mediated knockdown, to determine the effect that decreased MED12 expression has on Notch1 and Notch3 intracellular domain activity. Understanding the interaction of MED12, Notch1, and Notch3 and their influence on self-renewal and adipogenesis will increase understanding of hASC cell fate for applications in regenerative medicine. To continue support for stem cell research, public education of the basic science and medical relevance of stem cells should be addressed. I am currently creating a book to communicate fact-based stem cell content, address common misconceptions, and promote positive student-science relationships for increased science engagement in elementary audiences. Together, these studies aim to elucidate regulatory mechanisms in the interaction of the Notch signaling pathway and MED12 cofactor in hASC self-renewal and adipogenesis while providing fact-based public educational material for continued support of stem cell research and clinical applications.

## **The Role of Notch1 and Notch3 in hADSC Adipogenesis**

Mengcheng Liu<sup>1</sup>, Hannah Logan<sup>2</sup>, and Jamie Newman<sup>3</sup>

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Human adipose-derived stem cells (hADSCs) are multipotent cells with great potential in regenerative medicine. Notch is a conserved contact-dependent signaling pathway that determines cell proliferation and differentiation. The pathway includes four membrane receptors, Notch1-4, and our goal is to explore the role of Notch1 and Notch3 in hADSC adipogenesis to understand how they work together to regulate cell state. We found that the loss of Notch3 promoted adipogenesis as demonstrated by increased lipid droplets and enhanced expression of adipose-related genes. In addition, we observed increased expression of Notch3 during adipogenesis. Expression of Notch1 also increased during adipogenesis but, unlike Notch3, appears to promote lipid accumulation. Immunofluorescence showed that Notch1 was enriched in adipocyte differentiated hADSCs while Notch3 was highly expressed in and only in adjacent hADSCs not undergoing adipogenesis to maintain cells at stem cells state. Our research provides new targets for directed differentiation in tissue regeneration.

Format: Poster presentation

# Myogenic Differentiation of Adipose-Derived Stem Cells for Tissue Engineering

India Pursell<sup>1</sup>, Heather Vogel<sup>1</sup>, Haley Barnett<sup>1,2</sup>, Mary Caldorera-Moore<sup>3</sup>, and Jamie Newman<sup>1</sup>

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Volumetric muscle loss (VML) is characterized by muscle injury where the tissue is not able to regenerate naturally. This can occur from combat injuries, traumatic injuries such as car wrecks, surgical procedures such as tumor removal, or abnormal muscle conditions such as muscular dystrophies. There are currently no treatment options for de novo muscle regeneration or function for patients suffering from VML. Multipotent stem cells, such as human adipose stem cells (hASCs), offer the most promise in cell-based regenerative therapies due to their self-renewing capabilities, their ability to differentiate into cells found in mesoderm tissues and the ease with which they can be harvested from patients. hASCs have the potential to differentiate towards a myogenic lineage, however, there is currently no differentiation media that can yield more than 15% myogenic success. Here we focus on optimizing a myogenic differentiation media recipes for hASCs. Initially, two myogenic medias were investigated for their differentiation potential at 2, 4, and 6 weeks of hASC culture. Reverse transcription polymerase chain reaction (RT-PCR) was utilized to determine if common myogenic markers, *desmin*, *myf5*, *myf6*, *myogenin*, *mhc*, and *myod* were expressed in hASCs after exposure to these medias. Immunofluorescence using the antimyosin antibody was also used to qualitatively evaluate differentiation. From these assays we identified a media recipe that reproducibly induces myogenic differentiation and we are currently testing different culture environments to continue working towards the creation of functional muscle tissue for clinical applications

## The role of Mediator subunit MED12 in adipogenesis

Joseph Straub<sup>1</sup>, Conner Hartupee<sup>1</sup>, Dr. Jamie J. Newman<sup>2</sup>

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Mediator, a large protein complex exclusive to eukaryotes, is a master regulator of cell-type specific gene expression. Mediator functions as an adapter that connects activators bound at enhancers to the transcription pre-initiation complex (PIC) located at the promoter. Our research focuses on how Mediator influences the differentiation of adipose-derived mesenchymal stem cells (ASCs). ASCs are harvested from adult donors and have the ability to self-renew and can differentiate down chondrogenic, osteogenic, and adipogenic lineages. We recently published findings indicating that knockdown of the Mediator subunit MED31 reduces adipogenesis in bone marrow-derived MSCs. We are now focused on MED12, a subunit of the Mediator complex kinase domain that appears to have a significant role in maintaining cell state. Our goal is to understand MED12's dual role as both a Mediator subunit in the regulatory kinase module and as a coactivator of transcription. We hypothesize that the loss of MED12 disrupts adipogenic differentiation in ASCs. Previously published research indicates MED12 coactivates  $\beta$ -catenin, a driver of adipogenesis, but little research currently links MED12 to the regulation of adipogenesis. We have performed siRNA-mediated knockdowns of MED12 in ASCs prior to inducing adipogenesis. ASCs display reduced adipogenesis as demonstrated by images of cell morphology and lipid vesicle staining. We have also optimized our sonication protocol for chromatin immunoprecipitation (ChIP) experiments and we are currently investigating MED12 genomic occupancy in order to determine the direct gene targets of MED12 during adipogenesis. Overall, this research is important for elucidating the requirements for proper regulation of differentiation of clinically-relevant ASCs, and the broader understanding of Mediator's function in ASCs will help foster their use in clinical applications such as regenerative medicine.

## Role of MED12 in Maintaining Structural Integrity of the Mediator Complex in Human Adipose Stem Cells

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Mediator, a large multi-subunit co-activator complex, that relays information from gene-specific transcription factors to RNA polymerase II, is grouped into 4 modules: head, middle, tail, and a dissociable four subunit kinase module consisting of MED13, MED12, CDK8, and Cyclin C (CCNC). MED12 acts as an activator of CDK8-CCNC in Mediator which in turn activates cell-type specific transcription factors<sup>1</sup>. Because of its essential role in key developmental pathways, mutations in MED12 leads to tumorigenesis and genetical disorders<sup>2</sup>. The concept concerning the structural and functional impact of MED12 on the module is still unclear. This research investigates the structural integrity of the Mediator complex in the presence and absence of MED12 in human adipose stem cells (hASCs). ASCs are multipotent stem cells that can self-renew and differentiate into different lineages with the help of transcription machinery, making them of great interest as a potential source in the fields of tissue engineering and regenerative medicine<sup>3</sup>. These considerations highlight the importance of studying kinase module subunits interactions, to better understand how MED12 contributes to specific genetic disorders and suggest new therapeutic strategies for human tumorigenesis.

We are testing the hypothesis that the loss of MED12 in the Mediator complex leads to loss of other subunits in the kinase module ultimately causing major structural changes in the complex. To determine effects on the Mediator complex following the loss of MED12, we use co-immunoprecipitation (CoIP) to pull down MED12 in hASCs grown under standard culture conditions and use western blots to determine Mediator subunit interactions. The MED12 antibody is used to pull down MED12 and its associated proteins. Analysis of the pull-down of MED12 is done by running an SDS-PAGE and probing for different subunits using specific subunit antibodies to detect each subunit interaction. The results of Co-IP of MED12 show that MED12 is not still attached CDK8 as we can see the presence of MED12 in elution sample and CDK8 in unbound lysate (Fig. 1A), whereas the results Co-IP of CDK8 show that MED12 is still bound to CDK8 (Fig. 1B) as we can detect the presence of both proteins in elution sample. We still have to redo the same process to confirm the stated results. To determine the interactions within kinase module in the absence of MED12, we performed siRNA mediated knockdown of MED12. Validation of knockdown of MED12 and its associated subunits was done by qRT-PCR and western blot. We will perform additional Co-IP and knockdown for each of the subunits that make up the kinase domain to investigate the interactions.

## **The impacts of sub-lethal fipronil pesticides on periwinkle snail (*Littoraria irrorata*) foraging and behavior**

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Low concentrations of pesticides are entering coastal estuarine systems via run-off from agricultural fields and residential areas. These low sub-lethal concentrations of pesticides may not kill coastal species, but may negatively impact important behaviors such as the ability to forage and avoid predators. Understanding how pesticides alter these behaviors is important because these behaviors dictate the magnitude of trophic cascades which can affect the structure and function of coastal marsh communities. Periwinkle snails (*Littoraria irrorata*) are significant primary consumers in coastal marshes because they fungal farm and forage on *Spartina alterniflora* grasses. Periwinkle snails can drastically reduce marsh production unless they are limited by predators that either consume snails (non-consumptive effects) or cause them to reduce their foraging and alter other behaviors due to fear (non-consumptive effects). Despite the importance of trophic interactions in this marsh system, minimal studies have been conducted on whether pesticides impact periwinkle predator avoidance behavior and foraging which would ultimately impact marsh production. To determine if the insecticide fipronil influences periwinkle snail foraging and predator avoidance behaviors, we are exposing periwinkle snails to sub-lethal concentrations of the pesticide with and without exposure to blue crab (*Callinectes sapidus*) chemical cues. Seawater was prepared with and without blue crab chemical cues, after which fipronil was added at four concentrations: 0ug/L, 1 ug/L, 5 ug/L, 10ug/L. This water was placed into bowls with four snails, and four plastic dowel rods which were used to mimic the structure of *Spartina* grasses. One 8cm piece of *Spartina* leaf and one 1cm square of algae was added to measure grazing throughout the experiment. Over a five-day trial period, we measured snail climbing height, emergence and righting times to measure the differences in snail behavior; as well as *Spartina* and algae consumption to measure foraging. We hypothesized that higher concentrations of fipronil will result in reduced foraging on *Spartina* and algae due to avoidance of the pesticide dosed water and that responses to blue crab chemical cues will be reduced due to pesticide exposure. The results of our experiment will demonstrate if low concentrations of pesticides may alter consumer foraging behavior which can lead to the loss of important marsh ecosystem services such as sediment trapping and nursery habitats.



# The sublethal effects of fipronil pesticide on a coastal marsh trophic cascade

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Anthropogenic changes, such as pollution, can significantly impact coastal communities by reducing organismal diversity and survival and can result in habitat loss. Amongst many pollutants, pesticides represent one such threat to coastal ecosystems. Currently, pesticides enter estuarine systems through run-off and freshwater inputs. While the concentrations of these chemicals may be low, they can still significantly impair the structure and function of many ecological communities through sublethal impacts on non-target animal physiology and behavior, including the ability of organisms to consume prey and avoid predators. Ultimately these impacts to behavior are important as they affect the magnitude and direction of trophic cascades which structure important coastal habitats. In coastal marsh systems, blue crabs (*Callinectes sapidus*) play a dominant role by consuming periwinkle snails (*Littoraria irrorata*) and by causing snails to climb out of the water to escape predation. Fewer numbers of snails, or fewer snails in the water, can result in more cordgrass growth and higher marsh productivity. Although the interactions of blue crabs and snails on cordgrass growth and marsh productivity is well known, it is unclear how or if pesticides may affect this trophic cascade. In this study, I propose to study the sublethal effects of fipronil on this coastal marsh food web by creating mesocosms with three treatments mimicking the three trophic levels in this system: cordgrass only, cordgrass and snails, and cordgrass, snails, and crabs. The effects of fipronil exposed crabs on consumptive and non-consumptive effects on snails will be assessed by snail death and snail foraging behavior. Impacts of fipronil on cordgrass consumption will be quantified by measuring cordgrass shoot growth, change in number of cordgrass live and dead leaves, and number of grazing scars. The results of our experiment are important as planned freshwater diversions in the Mississippi may lead to decreased cordgrass growth and increased marsh erosion.

## Pure Expectations: Examining the Meaning and Implications of Virginity Culture

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This retrospective qualitative investigation seeks to understand the messages that youth received about virginity from their families and communities. Utilizing a narrative approach, seventy (n=70) young adults wrote a one-page, single-spaced narrative (approximately 650 words) in which they reflected on the messages they received about virginity throughout childhood and adolescence. A feminist theoretical framework guided the development of this study and informed the data analysis, which was conducted through an intensive constant comparative process of open, axial, and selective coding techniques. Members of the research team separately reviewed each narrative before coming together to discuss codes and create a unified, yet flexible, coding scheme that revealed how virginity was discussed, policed, and challenged in their families of origin and local communities. Preliminary findings suggest a tension arises between what youth are told throughout middle and high school, and what they come to believe through their own experiences that lead to a critique of the earlier messages they were told about virginity. Embedded in family systems as well as social systems, including schools and churches, expectations of virginity were pervasive. Are participants' bodies their own? Or do they belong to their parents? Teachers? Faith communities? Peers? Findings reveal a culture exists in which a young girl is presented with seemingly two options: a) choose virginity until heterosexual marriage, which is enforced in a plethora of manners, including signing a contract with her father, attending a mandatory Rings and Things or Love Waits lecture at a public school, purchasing a purity ring, signing a virginity pledge, or attending a purity ball, or b) not choosing to save virginity for marriage. Findings reveal a collective effort between families and communities to promote a false sense of agency amidst a backdrop of prevailing expectations that, if not followed, could hurt not only the young woman, but her family and community, as well.

## A Comparison of Early Childhood Health Indicators

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The most commonly used indicator for early childhood health in the medical and scientific communities has been body mass index (BMI) and parent report. However, it is hypothesized that a holistic approach to the health analysis of children based on a variety of indicators, including a comparison of BMI, parent report, and Resonance Raman Spectroscopy (RRS) scans could lead to a more accurate measurement and understanding of children's health status. If children have a healthy BMI and parents report that they frequently eat fruits and vegetables, but they have a low RRS value, it can be concluded that they are not as healthy as their eating habits and BMI suggest. In contrast, children with an unhealthy BMI and parent responses that suggest frequently eating fruits and vegetables, but a high RRS scan could indicate that the child is healthier than their BMI suggests. Factors possibly influencing health indicators include: ethnicity, gender, frequency of sugary or fast food, household income, and Supplemental Nutritional Assistance Program (SNAP) benefits. The current study explores the correlation among these health indicators (BMI, parent interview responses, and RRS scans) among a sample of preschoolers in Lincoln Parish to seek a greater understanding of early childhood health and, from these findings, take steps to improve the health of our community. Preliminary results suggests that while there is some overlap among indicators as expected (e.g., BMI category was positively, significantly correlated with parent report of fast food consumption,  $r = .29$ ,  $p = .01$ , RRS category was negatively, significantly correlated with parent report of sugary drinks,  $r = -.31$ ,  $p = .03$ , and RRS category was positively, significantly correlated with parent report of child carrot consumption,  $r = .34$ ,  $p = .02$ ), there is no as much overlap as would be predicated suggesting that there are distinct conclusions that can be drawn from each health indicator which indicating the need for interventionists and medical practitioners to use a variety of tools in making decisions related to nutrition-related health outcomes.

## The Product Analysis of Women's Athletic Tops

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The purpose of this project was to determine how apparel construction affects the fit, performance, and cost of a garment.

To find the sizing, garments were measured at the waist, hip, bust, and arm length before laundering and after 10 launderings. The original and washed measurements were compared to each other as well as the standard sizing measurement to determine fit for each brand. To determine the construction of the garments, the type of seams used to construct each brand were evaluated based on the Federal Standards for seam type and stitching classes. To compare garment labels, aesthetic similarities between our four brands were compared, and they each had very similar characteristics. Differences in fiber content, country of origin, care requirements, fabric construction, and size, as well as differences in tag appearance based on color and print were also evaluated. The cost to manufacture each athletic top was determined based on the construction characteristics of the tops including materials, trimmings, labor, packaging, as well as duties and taxes.

When comparing size and fit between the four athletic tops, the Champion, BCG, and Under Armour brands all met their standard sizing charts, but the Avia brand did not. The Avia brand measured larger than its standard, but it shrunk by one inch after laundering, which made it meet its standard size. The Champion brand shrunk two inches. The basic construction of all four garments are very similar. The main costing difference between each garment is their country of origin.

Based on research, the Avia brand athletic top is the overall best brand out of the four analyzed. It had very little shrinkage, and it was the closest to meeting its standard size in bust, waist, hip, and sleeve length measurements. Laundering had very little effect on how the Avia top measured up to its standards. At the bust and waist, the shrinkage due to laundering actually helped meet the sizing standards. Avia also excelled in cost because it had the lowest selling price after all costs were calculated. Each of the brands performed very similar, but Avia's total cost is much less.

## Serviceability of Baby Onesies

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We performed this study to evaluate which brand of baby onesies would uphold its serviceability according to its textile properties. The brands that were tested included Polo Ralph Lauren, Carter's, Child of Mine, and Old Navy. We predicted that the Carter's brand would perform the best with all of the tests that we performed and would most likely keep its original dimensional stability.

To determine which brand performed the best we performed many tests on each baby onesie. We recorded the price, fiber content, and care instructions from the labels and hang tags on each garment. The fabric was evaluated by yarn structure, specimen weight, thread count, and fabric construction. Dimensional stability and appearance retention were evaluated after one, three, and ten launderings. Colorfastness to crocking, laundering, bleach, and perspiration were evaluated. We also tested fabric for wickability.

Child of Mine shrunk the least amount compared to the other three baby onesies. All of the brands did the same when it came to the crocking test and appearance retention. Each brand was affected by chlorine bleach except the Old Navy onesie and each brand was not affected by non-chlorine bleach. Child of Mine was the best in releasing stains. All of the brands failed the wickability test. Each brand also did very well in color fastness to laundering.

In conclusion, we have determined that Child of Mine was the best brand in serviceability. Even though it failed the wickability test, it did very well in releasing food stains and shrunk the least amount. We felt that It performed the best out of the other brands that we tested.

## Product Quality Analysis of Onesies

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The purpose of this project was to determine how garment construction affects product quality, performance, fit, and cost.

Onesies from four different brands were evaluated for construction, sizing and fit, and cost. Garment labels were reviewed for description of labels, fiber content, RN number, country of origin, care requirements, and extra voluntary information. Sizing specifications were evaluated by measuring the chest, waist, hips, sleeve length, leg in-seam, and garment length. Measurements were taken on the original unwashed garment and garment that was washed ten times for each brand. Cost sheets were completed for each onesie by examining the garments for materials, trimmings, and construction. Construction characteristics were evaluated to determine construction techniques for stitch and seam types. Design and fit characteristics were evaluated for shaping methods and styling.

The data indicates there are many differences between the onesies. They are all 0-12-month footie onesies. However, the quality of each onesie varies based on design and production. Each onesie was constructed with different types of seams, as well as different types of stitching, some including ornamental stitching. Production and cost wise, each of the garments have different costs from production. Sizing and fit are important factors when it comes to the garment quality and fit. There are not any industry standards for sizing measurements, but all the garments were relatively close in starting size except Carter's Just One You, which was substantially smaller. Each of the garments shrunk in some capacity after being washed, but some much more than others because of quality.

In conclusion, the onesie that performed the best in durability, cost, and production was the Carter's Child of Mine.

## The Serviceability of Athletic Jackets

Blythe Bissell<sup>1</sup>, and Madeline Barr<sup>1</sup>, Lily Huggs<sup>1</sup> and Kathleen Heiden, PhD<sup>2</sup>

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The purpose of this research project was to test the performance of three different brands of athletic tops from BCG, Under Armour, and Avia to determine which brand had the best serviceability according to the textile properties. The general construction of each of these shirts was classified according to the yarn and weave structure, method of coloration, fabric weight, and the thread count.

Dimensional stability and appearance retention of each garment were evaluated after one, three, and ten launderings. Colorfastness to crocking, laundering, bleach, and perspiration were evaluated. Each of the garments ability to resist stains was tested by applying ketchup, chocolate syrup, vegetable oil, mayonnaise, yogurt, butter, and mustard to a swatch of each of the garments. Wickability was also tested.

Avia had the greatest amount of shrinkage by 5% in length while Under Armour and BCG had zero percent shrinkage throughout the 10 launders. The appearance retention of the Under Armour and BCG tops were identical during the laundering process as their color never really faded. Each garment also had zero to no wrinkle throughout the process.

All of the jackets are composed of polyester, Under Armour and BCG both being 100%, and Avia being 95% Polyester and 5% spandex. All three brands outperformed the minimum industry standards for most tests. We concluded that the BCG jacket was the best choice for customers, performing even better than Under Armour, and costing \$35.00 less. It is also cheaper than the Avia jacket and performed significantly better than Avia. We believe that for the least expensive product we tested with the best results out of the three, that the BCG jacket will be the garment that provides the highest customer satisfaction.

## Evaluation of Nutrition Education Needs of High School Cheerleaders

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Youth sports and athletics play a critical role in adolescent education and development. Despite the evolution of athletic training methods and equipment available to adolescent athletes, a lack of nutrition education for these athletes remains an issue. The purpose of this project was to assess the need for nutrition education for adolescent female cheerleading athletes and develop an education intervention to address the findings of the assessment.

Twenty female cheerleaders from a local high school completed the assessment survey. Results of the assessment indicated female adolescent athletes lack knowledge about general nutrition, as it relates to their sports performance, and basic nutrition information. Although participants stated they consumed pre/post workout snacks, they were unaware if what they were consuming was appropriate. Participants also stated they frequently consumed fast food, with 30% stating they ate fast food five or more times per week. Sources of nutrition information were varied with 47% getting the majority of their nutrition information from family, 45% from the internet and 30% from friends. Additionally, no respondents stated they had worked with a registered dietitian to meet nutrition needs. Respondents indicated a desire for more information regarding foods to eat for enhanced performance, the impact of pre/post workout snacks, maintaining weight, and healthy food options.

An educational intervention was designed to address the findings of the assessment. The educational intervention included a 20-minute lesson on the importance and function of macronutrients in athletic performance. A recipe demonstration and food tasting were conducted with the lesson. Seventeen cheerleaders participated in the educational intervention. Non-formal evaluation of the educational intervention showed that most of the participants were able to provide examples of healthy and unhealthy carbohydrate options and able to explain the importance of macronutrients in physical activity. Furthermore, all participants were able to recall a fact related to proper nutrition for pre/post workout. Overall, the participants were receptive to nutrition education and actively participated in the lesson.

Future programs designed for this audience should include healthy options when dining out, how to prepare and consume foods that meet energy needs for athletes, and how to identify reputable sources for nutrition and health information.



## **Fueling Strategies, Dietary Habits, and Sources of Nutrition Information of Collegiate Cheerleaders**

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Understanding the nutritional knowledge and food choices of collegiate athletes is important to ensure each athlete is receiving adequate fuel to sustain a high level of physical activity. The purpose of this study was to evaluate the snacking habits of the Louisiana Tech University cheerleading team. Participants were surveyed to assess their baseline knowledge of nutritious snacking and confidence in their ability to make nutritious meal choices. Participants included forty men and women on the Louisiana Tech University cheerleading team between the ages of 18 and 23. An 11-item survey was given to assess the participants understanding of pre and post workout fueling and their current habits. Of the sample, 58% felt comfortable making healthy dietary choices when dining away from home, 53% felt confident choosing healthy options when grocery shopping, 45% felt that they do not have adequate time to prepare healthy foods, 50% felt that they knew how to make healthy food choices but made unhealthy choices regardless, and 60% believed that their nutritional needs as an athlete differed from those of the average college student. Over half of the participants, 75%, consumed 2 or more snacks per day, with mean snack consumption being 2.3 snacks per day. Also, 70% stated that they altered their snacking habits based on physical activity level. All participants confirmed that they were physically active at least one day per week and indicated that a typical workout session lasted from 31 to 90 minutes. The majority of participants, 88%, indicated that they received nutritional information from popular media sources, friends and family, or coaches, with only 12% indicating that they consulted a registered dietitian or other healthcare provider for dietary guidance. College athletes have additional nutrition needs due to increased physical activity level and may not be receiving appropriate nutrition education from reputable sources. Future educational programs should focus on teaching collegiate athletes the benefits of consulting registered dietitians for nutritional information rather than popular social media sources. In addition, it would be advantageous for athletes to have a tool that can guide them to reputable sources such as MyPlate and the Academy of Nutrition and Dietetics when seeking nutritional guidelines.

## Evaluation of Breakfast Eating Habits of Female College Students

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Breakfast eating habits can positively or negatively affect one's health. Skipping breakfast has been associated with weight gain, depressed mood, and overall academic performance. The purpose of this project was to: 1) assess the breakfast consumption habits of female college students, the reasons for specific habits, and the students understanding of the benefits of consuming breakfast; and 2) design an educational intervention to address the findings of the assessment.

Participants for the assessment (n=7) were female college students between 18 and 20 years of age and members of an on-campus sorority. Evaluation was conducted using an 8-question survey instrument. The survey instrument obtained information regarding participants' breakfast eating habits, their reasons for skipping breakfast, and their knowledge of the impact breakfast can have on mood and weight. Only 29% of respondents stated they ate breakfast daily, while 43% stated they consumed breakfast three to six times per week. Those that did not eat breakfast daily cited no appetite, not enough time, and not enough money as their main reasons. The majority of participants, 86%, indicated interest in learning quick and inexpensive healthful breakfast options.

A 20-minute nutrition education intervention was designed to increase participants' knowledge of the benefits of eating breakfast and give to participants examples of low-cost and easy to prepare healthful food options for breakfast. During the educational session, participants were able to take part in a taste testing of different low-cost and easy to prepare breakfast options. Additionally, participants were given recipes of other low-cost and easy to prepare healthful breakfast foods. All participants stated they found the lesson beneficial and stated they were likely or very likely to begin eating breakfast every day. Furthermore, all participants were able to list one example of a healthful ready-made breakfast food option and one inexpensive breakfast food option. All participants were able to identify one benefit of eating breakfast and stated that receiving recipes was a positive aspect of the educational program.

One limitation of this project was its size. Future research and projects should expand to other sororities or groups on campus. Lack of time, resources, and food preparation knowledge is a noted barrier to breakfast consumption for this target audience, and therefore, future educational interventions should not only include basic nutrition education but should also include recipe demonstrations and taste testing of recipes.

## **The Overall Acceptability, the Nutrient Density, and Costs of Substituting All-Purpose Flour with Selected Vegetables of a Yeast-Free Pizza Crust**

Catherine Fontenot<sup>1</sup>, PhD, RD, LDN<sup>1</sup>; Ashton Armstrong<sup>2</sup>, Emily Stephens<sup>2</sup>, Shannon Cessna<sup>2</sup>

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Pizza is a favorite food across all ages (Rhodes et al, 2014). Unfortunately it can be high in calories, refined carbohydrates, and minimal dietary fiber. Today, it is not uncommon to be able to purchase cauliflower made with rice, mashed potatoes, and pizza crust. The availability of these foods are opportunities for US citizens to include more vegetables in their diet and enhance their overall diet quality. Therefore, the purpose of this research study was threefold: 1). assess overall acceptability of pizza crust prepared with selected vegetables, 2). compare the cost of pizza crust prepared with vegetables to the cost of preparing a yeast-free pizza crust, and 3). compare the nutrient composition of pizza crust prepared with vegetables to the nutrient composition of a yeast-free pizza crust made with all-purpose flour. The researchers prepared the recipes following the control recipe procedures for each recipe variation. Three laboratory experiences were conducted using a taste-test panel made up of fellow classmates. For each laboratory experiment, research members completed the same task for preparing the recipes to control for errors that would influence outcomes of the study. The panelists used a scorecard to assess selected sensory qualities that included color, texture, flavor and overall acceptability of the four samples presented for each lab; the scorecard scale ranged from one to five with one representing uneven browning/soft/bland/unappealing/would not eat again and five representing golden brown/good ratio between soft and crispy/desirable taste/would definitely eat again. Prior to each taste-testing, the researchers prepared a plate divided into four quadrants. A 2” X 2” sample was prepared by using a pizza cutter to cut the piece from the center of each recipe variation. Each sample was identified by a random number that was indicative of a specific recipe variation. After each experiment, the recipe was adjusted according to the ratings and any comments made on the scorecards. The researchers also used lab notebooks to record any notes that documented odd occurrences during the mixing and baking of each recipe variation. The notebooks were also used to document recipe adjustments for the next laboratory experiment. The final recipe of each variation was nutritionally analyzed using the nutritional analysis provided by the recipes retrieved from on-line sources and the costs of each recipe was determined using grocery sales receipts and CookKeepBook.com. Results from the taste testing indicated all of the recipe variations were acceptable based on appearance, texture, and flavor with all of them receiving a score of 4 or above. In terms of nutritional composition, the fiber content was highest in the recipe using broccoli yielding 8.3 grams compared to 2.0 grams fiber in the control. In terms of costs the control was \$0.37 per serving and the cauliflower was \$0.97 per serving; the broccoli recipe variation was \$0.90 and the zucchini recipe was \$0.93. The limitations of this study were the limited time frame available to conduct the study and the limited access to panelists who were unfamiliar with the study. On the other hand, the strengths of the study were access to the tools necessary to execute the study and availability of sufficient

quantities of the ingredients needed to conduct each laboratory experiment. This study indicates that vegetables are viable options for enhancing the dietary fiber content of the current food supply. Additional research is necessary to determine consumer acceptability of different foods prepared with other vegetables and vegetable combinations.

## **Evaluating the Overall Acceptability, Nutrient Composition, and Costs of a Traditional Tator Tot Recipe Prepared with Selected Vegetables and Cooked Using An Air Fryer**

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Potatoes are the most popular vegetable consumed by Americans and the USDA reports that the form of the spud that is most commonly consumed is the French fries (PBH, 2015; Nestle, 2017). So, tator tots which are similar to French fries are a favorite side-item for many. Parents especially enjoy them because most children will eat them, they are easy to prepare, and can be eaten with fingers. Unfortunately, when they are purchased frozen and fried again, the caloric content increases. a typical serving of baked tator tots (9 tots) has 160 kcalories, 8 grams fats, and 2 grams fiber (My Food Diary, 2019 Most people do not realize these products high in calories and fat because food manufacturers flash-fry them before freezing. Even when prepared from scratch and fried at home, the fat and calorie content remains high. Marrying potatoes with vegetables that are high in dietary fiber and vitamin A and vitamin C could be a way to increase vegetable consumption in children. Furthermore, cooking these products using an air fryer to mimic the texture of a traditional fried product could be a viable option for enhancing the nutrient density of a familiar food (Arias,2019). Therefore, the purpose of this research study was threefold: 1). to evaluate a taste panelists overall acceptability of tator tots prepared with carrots, zucchini, and cauliflower and cooked with an air fryer, 2). to compare the nutritional composition of the tator tot recipe variations with the control tator tot recipe, and 3). to compare the costs of the recipe variations with costs of the control recipe. The researchers prepared the recipes following the control recipe procedures for each recipe variation. Three laboratory experiences were conducted using a taste-test panel. For each laboratory experiment, research members completed the same task for preparing the recipes to control for errors that would influence outcomes of the study. The panelists used a scorecard to assess selected sensory qualities that included color, texture, flavor and overall acceptability of the four samples presented for each lab. Prior to each taste-testing, the researchers prepared a plate divided into four quadrants. A 1.5” X 1.5” sample was prepared by using a leveled tablespoon measure to scoop each variation. Each sample was rolled to form a uniform shape that resembled a traditional tator tot. The control tator tot recipe was deep-fat fried, but the recipe variations were cooked using an air fryer. Each sample was identified by a random number that was indicative of a specific recipe variation. Panelists used a scorecard for each sample using a scale ranging from one to four with one representing bland/soggy/pale/would not eat again and four representing balance between salty with light sweetness/crunchy/uniform golden brown/would definitely eat again. Each recipe was adjusted according to the ratings of the samples and any comments that panelists may have communicated to the researchers using the scorecards. The final recipe of each variation was nutritionally analyzed using [www.happyforks.com](http://www.happyforks.com) and the costs of each recipe was determined using grocery sales receipts and [CookKeepBook.com](http://CookKeepBook.com). Overall, the taste panelists preferred the control tator tot recipe giving it an overall acceptability rating of a 4. The panelist scored recipe variation prepared with zucchini and cauliflower with an overall acceptability of 3.25 followed. The least favorite

of the three recipe variations was the one prepared with carrots, receiving an overall acceptability rating of 2.25. The tots prepared with zucchini, cauliflower, and carrots per serving had more vitamin A, vitamin C, and dietary fiber than the control; they were also less in total calories, sodium and saturated fat. The costs of each recipe varied across all recipes with the control being the least expensive to prepare with a total costs of \$1.35 and the cauliflower being the most expensive with a total costs of \$6.16 and the zucchini and carrot variations costing \$3.25 and \$1.52, respectively. The limitations of this study were the limited time frame available to conduct the study and the limited access to panelists who were unfamiliar with this study. On the other hand, the strength of the study were access to the tools necessary to execute the study and availability of sufficient quantities of the ingredients needed to conduct each laboratory experiment. This study indicates that nutrient dense vegetables are a viable option for enhancing the nutritive qualities of foods typically considered unhealthy. Additional research is necessary to determine consumer acceptability of vegetables incorporated into familiar foods that are a standard component of the Western Diet and find ways to enhance the taste profile of foods prepared with vegetables.

# **Evaluation of the Cost Effectiveness, Protein Composition, and Acceptability of Peanut Butter Protein Bites Prepared with Cricket Powder, Plant-Based Protein Powder and Whey Protein**

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It is prudent for Americans to focus efforts in developing services and products that conserve natural resources, lesson the human carbon-footprint, and using products and processes that sustainable and renewable. Over the years researchers have developed genetically modified (GMO) plants that endure sever weather conditions and/or produce greater yields to meet the demands of the growing population. But, GMOs have been met with resistance from consumers. Researchers have worked to find natural alternatives that satisfy the health concerns and environmental demands of an ever-growing population. Insects are commonplace in the diet of many cultures. Specifically, crickets have been considered to be part of the solution to the challenges that come with feeding the masses as they require minimal resources to grow and harvest, and are inexpensive to farm. Cricket flour made with 100% crickets have 11 grams protein per 2 tablespoons, contain all essential amino acids and is an excellent source of vitamin B<sub>12</sub>; ((Cricket Flours, 2019; Norris, 2019). Plant-based proteins have also gained popularity because they are an excellent source of protein for those choosing to follow a vegetarian-type diet and others who are consumed with levels of greenhouse gases associated with climate change (Armitage, 2019). Whey protein is one of two proteins found in cow's milk and has been available in powder form for many years and is very popular among athletes to help support lean muscle mass. The purpose of this project was to threefold: 1). enhance the protein content of peanut butter energy bites by adding cricket powder, plant-based protein, and whey protein to the standard recipe, 2). compare the overall taste-test panel overall acceptability of peanut butter energy bites prepared with the addition of cricket powder, plant-based protein, and whey protein to the standard recipe, and 3). compare the costs of each recipe prepared with cricket powder, plant-based protein, and whey protein to the control. The researchers prepared the recipes following the control recipe procedures for each recipe variation. Three laboratory experiences were conducted using a taste-test panel which was made up of fellow classmates For each laboratory experiment, research members completed the same task for preparing the recipes to control for errors that would influence outcomes of the study.. The panelists used a scorecard to assess selected sensory qualities that included color, texture, flavor and overall acceptability of the four samples presented for each lab. Prior to each taste-testing, the researchers prepared a plate divided into four quadrants. A 1" X 1" sample was prepared by using a leveled tablespoon measure to scoop each variation. Samples were rolled between researchers palms to form a uniform, well-rounded ball and identified by a random number that was indicative of a specific recipe variation. Panelists used a scorecard for each sample using a scale ranging from one to three with one representing bitter/chalky/grainy/unappealing/would not eat again and three representing balance between sweet and salty/smooth mouthfeel/good ratio of oats and chocolate chips/would definitely eat again. Each recipe was adjusted according to the ratings of the samples and any comments that panelists may have communicated to the researchers using the scorecards. The final recipe of each variation was nutritionally analyzed using [www.happyforks.com](http://www.happyforks.com) and the costs of each recipe was determined using grocery sales

receipts. The four panelist rated the recipe prepared with plant-based protein received an overall acceptability of 3.0 whereas the recipe with the cricket protein was the least acceptable by the panelist with a 2.7 overall acceptability. In terms of nutritional composition, the protein content was highest in the recipe using the whey protein yielding 2.9 grams compared to 1.9 grams protein in the control. The plant-based protein had 2.5 grams and the cricket protein variation had 2.7 grams. In terms of costs, the control was \$0.23 per serving and the cricket protein was \$0.29 per serving; the plant-based protein was \$0.23 and the whey protein was \$0.23 per serving. The limitations of this study were the limited time frame available to conduct the study and the limited access to panelists who were unfamiliar with this study. On the other hand, the strength of the study were access to the tools necessary to execute the study and availability of sufficient quantities of the ingredients needed to conduct each laboratory experiment. This study suggests that alternative proteins are viable options for enhancing the protein content of the current food supply. Additional research is necessary to determine consumer acceptability of different foods prepared with cricket powder, whey protein, and plant-based protein powder.



# Evaluation of Selected Sensory Characteristics and Nutrient Composition of a Traditional Cornbread Recipe Prepared with Flour Alternatives

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Cornbread is a southern traditional side item that typically accompanies Louisiana iconic foods. Unfortunately cornbread can be low in dietary fiber and relatively high in fat. A traditional slice (2" X 2" square) yields approximately 170 kcalories, 4.5 grams fat, and 1 gram dietary fiber (USDA Food Database, 2019). When cornbread is eaten in combination with other southern foods such as fried chicken and dirty rice, the caloric intake from refined grains and added fat can influence the consumption of excess calories and reduce the opportunity for eating foods higher in fiber. Therefore, it is not surprising that the southern states have a large percentage of their adult population suffering from chronic diseases such as heart disease, diabetes, and obesity (CDC, 2019). Researchers implicate the overconsumption of calories from refined grains, total fat, especially saturated fat and minimal dietary fiber intake (Bareuther, 2009). Given cornbread's popularity among many southerners, it seems prudent to enhance the nutritional composition of this food. Therefore, the purpose of this study was threefold: 1). compare the overall taste panel overall acceptability of a traditional cornbread recipe to three recipes prepared with coconut flour, chickpea flour, and almond flour and 2). compare the nutritional content of each recipe variation to the nutrient composition of the traditional cornbread recipe. The researchers prepared the recipes following the muffin method used for mixing quick bread. Three laboratory experiences were conducted using a taste-test panel made up of fellow classmates. For each laboratory experiment, research members completed the same task for preparing the recipes to control for errors that would influence outcomes of the study. The panelists used a scorecard to assess selected sensory qualities that included color, texture, flavor and overall acceptability of the four samples presented for each lab and rated each sample from one to three using a scale (one representing very undesirable to three representing very desirable). Prior to each taste-testing, the researchers prepared a plate divided into four quadrants. A 1" X 1" sample was cut from the center of each recipe variation to ensure presentation consistency across samples and samples were identified by a random number that was indicative of a specific recipe variation. Following each experiment, the recipe was adjusted based on the ratings and any comments made by panelists. The final recipe of each variation was nutritionally analyzed using [www.happyforks.com](http://www.happyforks.com). Results indicated the cornbread recipe prepared with coconut flour received an overall acceptability of 92% whereas the recipe using chickpea flour was the least acceptable with a 66% overall acceptability. In terms of nutritional composition, the dietary fiber content was highest in the recipe using almond flour yielding 1.76 grams per serving compared to .97 grams dietary fiber in the control. This study is similar to a study that used maize flour, cassava flour, and millet flour to enhance the protein content of bread (Nwokonie et al, 2017). Overall acceptability for breads using these flours were similar to the findings of this study. The limitations of this study were the limited time frame available to conduct the study and the limited access to panelists who were unfamiliar with this study. On the other hand, the strength of the study were access to the tools necessary to execute the study and availability of sufficient quantities of the ingredients

needed to conduct each laboratory experiment. This study indicates that alternatives flours are viable options for replacing part of the all-purpose flour in a traditional cornbread recipe. Additional research is necessary to determine which flour alternative or flour combinations would yield the best results when compared to other flours available.

## **Reduction of Refined Sugar Content, Taste Panel Overall Acceptability, and Costs Comparison of a Traditional Chocolate Brownie Prepared with Selected Vegetables.**

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Chocolate brownies are an American favorite snack food. Unfortunately brownies are typically calorically dense and nutrient poor accounting for 140 kcalories, 6.6 grams fat, 15 grams sugar, and 0.9 grams dietary fiber (Pennington, 2010). The Centers for Disease Control reports just one in ten adults meet the federal fruit and vegetable recommendations (CDC, 2019). The recommended consumption for adults is at least 1 ½ to 2 Cups of fruit and 2-3 Cups of vegetables per day (CDC, 2019). Researchers suggest the decreased in US consumption of fruits and vegetables has contributed to chronic disease such as diabetes. In 2015, 30.3 million Americans had diabetes and 7.2 million were undiagnosed (CDC, 2019). Recognizing it can be difficult to change eating habits and feeling as though a healthy diet precludes enjoying food favorites, the purpose of this project was to decrease the refined sugar content of a traditional chocolate brownie recipe using selected vegetables that included sweet potatoes, beets, and dates. In addition, a cost comparison and taste panelist overall acceptability was evaluated. The researchers prepared the recipes following the control recipe procedures for each recipe variation. For each laboratory experiment, research members completed the same task for preparing the recipes to control for errors that would influence outcomes of the study. Three laboratory experiences were conducted using a taste-test panel made up of fellow classmates. The panelists used a scorecard to assess selected sensory qualities that included color, texture, flavor and overall acceptability of the four samples presented for each lab. Prior to each taste-testing, the researchers prepared a plate divided into four quadrants. A 2" X 2" sample was prepared by using a serrated knife to cut the piece from the center of each recipe variation. Each sample was identified by a random number that was indicative of a specific recipe variation. Panelists used a scorecard for each sample using a scale ranging from one to five with one representing hard & dry/bitter/overcooked/burnt and five representing consistent fudge-like texture/rich and chocolatey/even color/desirable taste/moist. Each recipe was adjusted according to the ratings of the samples and any comments that panelists may have communicated to the researchers using the scorecards. The researchers also used lab notebooks to record any notes that documented odd occurrences during the mixing and baking of each recipe variation. The notebooks were also used to document recipe adjustments for the next laboratory experiment. The final recipe of each variation was nutritionally analyzed using [www.happyforks.com](http://www.happyforks.com) and the costs of each recipe was determined using grocery sales receipts and [www.CookKeepBook.com](http://www.CookKeepBook.com). The recipe using sweet potatoes had the highest overall acceptability with a score of 4.67 whereas the recipe prepared with the dates was the least acceptable by the panelist with a 4.45 overall acceptability. The sweet potato and beets recipe variations had an overall acceptability of 4.67 and 4.64, respectively. In terms of nutritional composition, the reduction of sugar was lowest for the brownies prepared with beets and sweet potatoes yielding 14 grams per serving; the control yielded 16 grams of sugar per serving. The fiber content was highest in the recipe using dates yielding 1.9 grams per serving compared to 1.7 grams fiber in the control. On the other hand the sweet potato recipe yielded 1.6 grams

dietary fiber and the beets recipe yielded 1.5 grams dietary fiber. In terms of costs the control was \$3.23 per recipe and the dates was \$5.04, while the beets and sweet potato variations costs were calculated at \$3.52 and \$3.33, respectively. The limitations of this study were the limited time frame available to conduct the study and the limited access to panelists who were unfamiliar with this study. On the other hand, the strength of the study were access to the tools necessary to execute the study and availability of sufficient quantities of the ingredients needed to conduct each laboratory experiment. This study indicates that vegetables are viable options for reducing the refined sugar content while also increasing the dietary fiber of the current food supply. Additional research is necessary to determine consumer acceptability of different foods prepared with other vegetables and vegetable combinations.

## **Beliefs about Multi-Vitamin and Mineral Supplements in College-Aged Students – Differences Between Users and Non-Users**

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This was one part of a larger study designed to examine beliefs about multi-vitamin and mineral (V&M) supplements in college students. Two hypotheses were tested: that there would be no significant difference in beliefs of those students who take V&M supplements and those who do not; and that weight status would not differ between users and non-users of V&M supplements. A convenience sample of 335 students from Louisiana Tech University completed a two-page questionnaire. Information collected included demographics; self reported weight status, exercise habits and interest in nutrition; and beliefs about 18 statements scored using a Likert scale, where 5 = strongly agree and 1 = strongly disagree. Participants were between 18 and 25 years of age, with 44% being male. Only 23 students self-reported as underweight (7%), 243 reported having a normal weight (72%), and 69 self-reported as overweight (21%). About 39% (n = 130) reported current use of V&M supplements. The data were analyzed using IBM SPSS, and hypotheses were tested using ANOVA and t-tests. Among users, 60% reported consuming V&M supplements for the purpose of immunity; 30% consumed them for physical appearance; 30% said they take them to complete their diets; 20% for physical performance enhancement; and 11% for weight loss management. Of the 205 nonusers, 197 (96%) said they would use V&M supplements if recommended by a physician, 171 (83%) if recommended by a nurse, 182 (88%) if recommended by a dietitian, and 140 (68%) if recommended by a coach. Users were significantly more inclined to believe that physical appearance ( $4.26 + .62$  vs  $3.95 + .82$ ,  $p=.000$ ) and fatigue ( $3.50 + .79$  vs  $3.10 + .93$ ,  $p=.000$ ) could be enhanced by the use of V&M supplements. The belief that V&M supplements contributed to weight loss or weight gain was not different between users and non-users. Other differences in beliefs between users and non-users included the idea that supplements are a waste of money ( $1.84 + .68$  vs  $2.61 + .92$ ,  $p=.000$ ), supplements are needed only if you have a bad diet ( $1.94 + .88$  vs  $2.46 + .95$ ;  $p=.000$ ), and college students are not at risk for a V&M deficiency ( $1.62 + .77$  vs  $1.89 + .8$ ;  $p=.003$ ). Mean scores for most of the statements from both groups were close to 3 (neither agree nor disagree), suggesting a lack of certainty about the role of supplements. Results suggest a need for public education about vitamin and mineral supplements. Increased knowledge may impart a change in attitudes and beliefs among non-users. V&M supplements offer a plethora of health benefits. However, due to lack of regulation by the FDA, and a knowledge deficit in relation to supplements, misuse may be common.