

**Abstracts of the  
105<sup>th</sup> Oklahoma Academy of Science Technical Meeting  
November 4<sup>th</sup>, 2016**

**Oklahoma State University Center for Health Sciences – Tulsa**

**12-HETRE EXERTS ITS ANTITHROMBOTIC EFFECTS THROUGH THE PROSTACYCLIN RECEPTOR**

**Zitha R. Isingizwe**, Oklahoma Christian University, Edmond, OK

**Benjamin E. Tourdot, Reheman Adili, Meral Abraham, & Michael Holinstat**, University of Michigan, Ann Arbor, MI

**Theodore R. Holman**, University of California, Santa Clara, CA

**Best Undergraduate Paper of the Academy and Outstanding Undergraduate Paper in the Biomedical Sciences Section.**

Thrombotic diseases such as myocardial infarction and stroke remain the major contributor of cardiovascular related deaths. Our lab recently discovered that the antithrombotic effects of dihomo- $\gamma$ -linolenic acid (DGLA) are predominantly mediated by the 12-lipoxygenase (12-LOX) derived metabolite 12-hydroxyeicosatetrienoic acid (12-HETrE). 12-HETrE was shown to inhibit platelets activation by stimulating a yet to be identified G $\alpha$ s-coupled receptor. We hypothesize that 12-HETrE functions through one of the known prostanoid receptors (IP, DP1, EP2 or EP4). To determine whether 12-HETrE inhibits platelets through the known prostanoid receptors, platelets were incubated with a pharmacological inhibitor to one of the prostanoid receptors prior to treating platelets with 12-HETrE. The IP receptor antagonist partially blocked the inhibitory effects of 12-HETrE, suggesting that 12-HETrE signals at least in part through the IP receptor. IP receptor deficient mice were utilized to further characterize the role of the IP receptor in 12-HETrE-mediated platelet inhibition. 12-HETrE was unable to inhibit platelet aggregation in the IP receptor deficient mice, which further supports that 12-HETrE exerts its antiplatelet effects predominantly through the IP receptor. The understanding of DGLA-mediated platelet inhibition in this study will help to identify new therapeutic targets to control aberrant platelet activation, hence limiting the risk of unwanted clotting.

**EFFECTS OF FIRE INTENSITY ON SMALL MAMMAL COMMUNITIES— 5 YEARS POST FIRE**

**Laura E. Jardine, Adam K. Ryburn, & Anthony J. Stancampiano**, Oklahoma City University, Oklahoma City, OK

**Outstanding Undergraduate Paper in the Biological Science-Botany Section.**

We assessed the recovery and current status of small mammal populations in 3 mixed grass prairie habitats 5 years post burn in the Wichita Mountains Wildlife Refuge, Indianhom, Oklahoma. These sites represent 3 burn treatments: moderate burn, intense burn, and unburned. We sampled the small mammal fauna at each site using a Y-shaped array of Sherman and pitfall traps for a total of 800 trap nights/site. We used a modified point-intercept method to sample 80 habitat variables at 280 points at each site. These abundance-weighted data were subjected to principal components analysis to assess mammal affinities for habitat structure among the 3 sites. We also calculated mammal species diversity for each treatment. Component I represents a gradient from short, low density forbs and grasses, lichen covered cobble and boulders, and water disturbance to areas of taller grasses and

forbs with herbaceous litter ground cover. Component II represents a gradient from short forbs, tall herbaceous litter, and no disturbance to areas with tall forbs and grasses, short herbaceous litter, bare ground cover, and ungulate and human disturbance. Four species, *Peromyscus maniculatus*, *Cryptotis parva*, *Sigmodon hispidus*, and *Chaetodipus hispidus* clustered tightly on the positive loadings of PC I. *Neotoma floridana* occurred on the extreme opposite (negative) end of PC I and *P. leucopus* intermediate to these 2 groups. PC I explained 59.58% of the variation in the dataset. *Neotoma floridana*, *P. maniculatus*, *P. leucopus*, and *S. hispidus* clustered closely near the center of PC II while *Chaetodipus hispidus* was projected onto the negative end of PC II and *Cryptotis parva* onto the extreme positive end. Using the Shannon-Wiener Diversity Index, we determined that the moderate burn site had the greatest species diversity, the intense burn site had the second highest species diversity, and the unburned site had the lowest species diversity.

### **EFFECTS OF FIRE INTENSITY ON HABITAT RECOVERY IN A MIXED GRASS PRAIRIE ECOSYSTEM**

**Laura E. Jardine & Anthony J. Stancampiano**, Oklahoma City University, Oklahoma City, OK  
**Outstanding Undergraduate Paper in the Applied Ecology and Conservation Section.**

We assessed the recovery and current status of 3 mixed grass prairie habitats 5 years post burn in the Wichita Mountains Wildlife Refuge, Indianahoma, Oklahoma. These sites represent 3 burn treatments: moderate burn, intense burn, and unburned. We used a modified point-intercept method to sample 80 habitat variables at 280 points at each site. These data were subjected to principal components analysis to assess trends in habitat structure among the 3 sites. The first 2 components explained 100% of the variation in the dataset. Component I represents a gradient from short, low density forbs and grasses, herbaceous litter vertical cover, lichen covered cobble, and low disturbance to areas of tall, dense forbs and grasses, and animal disturbance. Component II represents a gradient from bare soil, moss, algae, gravel, shrubs, and graminoid crowns to areas with tall forbs, water disturbance cover, and boulders. Projections of the burn treatment sites onto principal components I and II indicate that the moderate and unburned sites cluster closely on component I (negative loadings) but are widely distinct along component II. The intense burn had the highest positive loadings along component I and is intermediate with respect to component II. High intensity fire results in more complete nutrient cycling from accumulated litter. This leads initially post fire to dense grass cover then increasing forb cover in the following years. Such an increase in forage density attracts large herbivores which inflict higher levels of disturbance to ground cover.

### **SMALL MAMMAL ASSEMBLAGE COMPOSITION AND HABITAT USAGE IN A SEMIRURAL LANDSCAPE**

**Cassandra Velasco & Anthony J. Stancampiano**, Oklahoma City University, Oklahoma City, OK  
**Outstanding Undergraduate Paper in the Biological Science-Zoology Section.**

During the summer of 2016, we studied the small mammal fauna at John W. Nichols Scout Ranch in extreme southeast Canadian County, Oklahoma. Six species of small mammals, including *Peromyscus leucopus*, *P. maniculatus*, *Neotoma floridana*, *Sigmodon hispidus*, *Reithrodontomys fulvescens*, and *Didelphis virginiana*, were represented in 52 captures. The habitat preferences for these species were then assessed using species' abundance and 21 habitat variables from 10 randomly selected plots. These data were subjected to principal components and niche overlap analysis. *Peromyscus leucopus*, *P. maniculatus*, *N. floridana*, and *D. virginiana* exhibited the highest degree of niche overlap, occurring mostly in habitats with large amounts of woody litter and overhead canopy. *Sigmodon hispidus* and *R. fulvescens* were found in open grasslands with high grass and forb cover. In this landscape, woodland habitat exhibits higher mammal species diversity probably

due to a greater amount of vertical structure.

### **TIME RESOLVED UV-VIS SPECTROSCOPY FOR MONITORING PEROXIDE VAPORS**

**Meagan E. Bobo**, Oklahoma Christian University, Edmond, OK

**Nicholas Materer & Allen Applett**, Oklahoma State University, Stillwater, OK

#### **Outstanding Undergraduate Paper in the Physical Sciences Section.**

The reaction of dark blue nanometric suspension of molybdenum or tungsten hydrogen bronze particles with nitrobenzene, hydrogen peroxide, or triacetone triperoxide results in a dramatic color change. Bronzes are formed from the trioxides by the incorporation of hydrogen into open channels present in WO<sub>3</sub> or between the sheets of MoO<sub>3</sub>. Hydrogen ions are attached to oxygen atoms in the channels. The electrons are delocalized giving an electrically conductive and highly colored material. In this project, spectroscopy was used to further confirm the mechanism of color change. Reflectance spectra were taken over a period of time at regular intervals to confirm the reaction is first order. The absorbance at each of the designated time intervals was recorded and plotted versus time to determine the rate of the reaction.

### **PERCEPTIONS OF MULTI-LEVEL MARKETING WITH MBA STUDENTS**

**Olivia Sharp & Robert Mather**, University of Central Oklahoma, Edmond, OK

#### **Outstanding Undergraduate Paper in the Social Sciences Section.**

Multi-level marketing organizations (MLMs) are rapidly growing and is the business practice of selling products or services through independent agents who are financially compensated for their sales. These organizations account for 75 percent of goods and services sold via direct channels (the Direct Selling Association 2003). The ethics of such marketing and Ponzi schemes have been the topic of recent discussion. However, there is no empirical research regarding the social cognitive factors that affect the receptiveness of a multi-level marketing target to a persuasive message. Testing MBA students will give a unique vantage point on the receptiveness of schemes, compared to previous studies (Mather et al., 2016). Attitudes will be measured by individual difference measures. Participants will then read a scenario in which they are at a career fair and are solicited to arrange a meeting to discuss a multi-level marketing opportunity. MBA students may be found to be more or less receptive to multi-level marketing. The findings from this study will contribute to the limited knowledge on multi-level marketing and reward mechanisms (Emek et al., 2011) of multi-level marketing.

### **CHARACTERIZATION OF PLANT PATHOGENIC *DIAPORTHE* SPECIES INFECTING MELONS IMPORTED FROM CENTRAL AMERICA**

**Matthew Broge, C. Biles, A. Howard, K. Karki, & B. Bruton**, East Central University, Ada, OK

#### **Outstanding Undergraduate Paper in the Microbiology Section.**

Interior rot of melon fruit (*Cucumis melo* L. var. *cantalupensis* Naudin) is caused by fungi of the *Diaporthe* species. Plant pathogens such as *Diaporthe* spp. enter the surface of the melon fruit early in development and remain latent until fruit maturity. While ripe fruit is harvested and imported with no external evidence of *Diaporthe* spp., internal fruit rot from *Diaporthe* spp. becomes evident as the fruit matures. The objective of this study was to characterize melon-infecting *Diaporthe* spp. in melon imported from Central America. Isolates were cultured from sunken surface lesions from melons imported from Costa Rica, Honduras, and Guatemala. Four *Diaporthe* spp. were isolated

from melons imported from Guatemala, six *Diaporthe* spp. isolates were found in melons imported from Costa Rica and none were isolated from melons imported from Honduras. The majority of the Costa Rican isolates were similar in spore type to *D. melonis* and *D. ueckerae*, whereas the Guatemalan isolates were similar to *D. sojae* and *D. curcurbitae*. Deoxyribonucleic acid (DNA) was extracted from fungal hyphae and purified polymerase chain reactions (PCR) products were sent for Sanger DNA Sequencing. Sequencing analysis demonstrated that our isolates were a 100% match of 509 base pairs for *Phomopsis* sp. ENS505 (Sequence ID: KM977662.1), a *Diaporthe* species native to Panama. Our finding of pathogenic *Diaporthe* spp. from Panama in melons imported from other Central American countries suggest that plant pathogens are carried across international borders and imported into the United States.

## HERMITE POLYNOMIALS

**Maranda Robin Clymer**, East Central University, Ada, OK

### **Outstanding Undergraduate Paper in the Mathematics, Statistics, & Computer Science Section.**

I investigate the n-dimensional Hermite polynomials. Beginning with the general multivariate normal, I will build the most general Hermite Polynomials. This process starts by taking partial derivatives. Once we have taken partial derivatives, we are able to define the Hermite polynomials. Then, I am able to calculate for different values of n. If I take n partial derivatives, I then get one entry for an n-tensor. I examine multiple properties of the polynomials, such as their orthogonality and symmetry. Finally, I restrict the Hermite polynomials to one-dimension. With the assumption of mean zero and standard deviation one, I recover the traditional Hermite Polynomials. With this information, I was able to help build the foundation of the Edgeworth Expansion.

## UPTAKE OF ARSENIC BY IRON HYDROXY CARBONATE (CHUKANOVITE): IMPLICATIONS FOR GROUNDWATER TREATMENT USING GRANULAR IRON REACTIVE BARRIERS

**Morgan Mackey**, East Central University, Ada, OK

**Richard T. Wilkin**, Environmental Protection Agency, Ada, OK

### **Outstanding Undergraduate Paper in the Environmental Sciences Section.**

Chukanovite ( $\text{Fe}_2(\text{OH})_2\text{CO}_3$ ), an iron hydroxy carbonate mineral, is a prevalent secondary mineral precipitate in granular iron permeable reactive barriers (PRB) used to treat contaminated groundwater. The buildup of secondary precipitates in PRBs, like chukanovite, can change the rate and efficiency of contaminant removal. Our goal is to determine what role chukanovite plays in controlling the efficiency and lifespan of PRBs. Chukanovite was synthesized based on previously developed methods, and confirmed through X-ray diffraction analysis. Batch sorption experiments were performed to determine how chukanovite controlled arsenic levels (arsenite and arsenate) in water samples. Experiments show that chukanovite can rapidly (<1 h) reduce arsenic levels in water and arsenic remains bound to chukanovite for extended periods of time. Equilibrium concentrations of arsenic were typically below 10  $\mu\text{g/L}$  at loadings of 2.3 g/L and initial arsenic concentrations of 1000  $\mu\text{g/L}$ . Studying different concentrations of arsenite under varying pH conditions shows chukanovite can incorporate up to 0.049 mol As/kg, and uptake is optimal at higher pH. Future studies will further characterize chukanovite using Fourier Transform-Infrared (FTIR) Spectroscopy, Scanning Electron Microscopy (SEM), and will test arsenate interactions with chukanovite under variable conditions.

## A NEW SPINYPOD FROM NORTHEAST TEXAS, *MATELEA HIRTELLIFLORA* AND A SYNOPSIS OF IT'S RELATIVES

Angela McDonnell, Oklahoma State University, Stillwater, OK

### Best Graduate Paper of the Academy.

A new species of spiny pod milkweed vine, *Matelea hirtelliflora*, has been described recently from Northeastern Texas. We distinguish this new species from it's closest relatives in Oklahoma and the Southeastern United States. A synopsis of the species, comparison to relatives, phylogenetic placement, and distribution are discussed.

## FINDING FLOW FOR FREE: THE FLOW EXPERIENCE IN VOLUNTEERISM

Jonathan D. Becker & Jennifer L. Kisamore, University of Oklahoma, Norman, OK

### Best Graduate Poster of the Academy.

This study examined flow experiences in professional work and volunteer activities. Flow experiences were expected to be more frequent the higher the perceived importance of the task and the higher the level of social interaction of the activity involved. Participants for this study were recruited from local non-profit organizations and the researcher's personal and professional networks. The online survey that was used assess flow and other relevant variables. Results of this study showed that people experience more flow in volunteer activities than in paid professional activities when age was controlled. Additionally, there was some evidence that people perceived volunteer activities as somewhat more important than work activities, although the results were not statistically significant. With a more robust measure of perceived importance, this may be an opportunity for future research. Finally, there was a statistically significant correlation between the level social interaction in volunteer activity and the level of flow experience in volunteer activity which suggests individuals experience more flow in volunteer work and that the level of flow experienced may be positively influenced by social interaction.

## OPTIMIZATION OF QUANTUM CELLULAR AUTOMATA: REINFORCEMENT LEARNING

Patrick Harrington, Department of Mathematics and Computer Science, Northeastern State University, Tahlequah, OK.

Quantum Cellular Automata (QCA) are vulnerable to manufacturing errors that change circuit polarization. Analysis and correction of these errors has been done using Bayesian, Markovian, or neural network methodologies. Our work uses intelligent agents to improve evaluation and correction of Gaussian error using partially observable Markov Decision Processes in a multi-objective environment.

## DOMINANCE RELATIONSHIPS IN JUVENILE FIVE-LINED SKINKS (*PLESTIODON FASCIATUS*): DOES SMALL SIZE MATTER?

Mark Paulissen, Department of Natural Sciences, Northeastern State University, Tahlequah, OK

I studied aggressive behavior of neonate Common Five-Lined Skinks (*Plestiodon fasciatus*). Two neonates of differing sizes were placed on opposite sides of a divided observation chamber for 48 hours. Then the partition was removed and a single retreat was placed in the center of the observation chamber, and the behaviors of the two neonates were recorded for 60 min. During an encounter, one lizard typically displayed aggressive behavior (lunging at or biting the other lizard) while the other lizard displayed submissive behavior (avoidance/fleeing/tail-wiggling); though in 24% of

encounters the two lizards showed no reaction to each other. Scoring of behaviors made it possible to determine which lizard was dominant and which was subordinate in each trial. The larger of the two lizards was dominant in 75% of the trials, and the smaller of the two lizards was dominant in 25% of trials. In trials in which the smaller lizard was dominant, the dominant lizard “won” barely over 50% of encounters compared to over 70% in trials in which the dominant was larger. In all trials, the two lizards spent significantly more time on opposite sides of the observation chamber than on the same side because the subordinate almost always fled from the dominant, often to the opposite side of the chamber. Nonetheless, the two lizards often used the retreat simultaneously.

## **EFFECT OF SALT (NaCl) AND SALT SUBSTITUTIONS ON DOUGH RHEOLOGY AND BREADMAKING**

**Zorba J. Hernández-Estrada, & Patricia Rayas-Duarte**, Robert M. Kerr Food & Agricultural Products Center, Biochemistry and Molecular Biology Department, Oklahoma State University, Stillwater, OK

Bread is a staple food worldwide and is responsible of 30% of the daily salt intake. High daily sodium intake has been widely associated with hypertension as well as numerous cardio-vascular diseases and other health problems. The effect of salt content and salt substitution using a potassium chloride based salt (NTS 24510) on mixing behavior, absorption properties, shelf-life (1, 3, and 7 days after baking), and sensory evaluation of white pan bread were investigated. The treatments included no salt (negative control), 0.5, 1.0 to 2.0% salt and substitutions of 33% and 40% salt with NTS 24510. Consumer acceptance was performed with 100 untrained panelists. Significant effects (Tukey;  $P=0.05$ ) were found in water absorption, development time and stability of dough, and wet gluten and elastic recovery of gluten (0%-2% salt). Salt substitutions and 2% salt treatments were similar ( $P>0.05$ ) suggesting that salt can be reduced up to 40% and have similar rheological properties. Crumb firmness evaluated with a Texture Analyzer TA.XT2i revealed softer crumb in the substituted treatments (9 to 30% softer,  $P<0.05$ ) compared to the control. However, consumers did not detect any effect of the treatments in bread firmness. No significant effects ( $P<0.05$ ) on white bread perception of saltiness, texture and seven other sensory attributes were observed when comparing the two substitution treatments with the control within 1 and 7 days after baking. Potassium chloride salt NTS 24510 at 33% substitution does not affect critical quality characteristics of white pan bread appreciated by bakers and consumers.

## **LATENT PLANT PATHOGENIC *DIAPORTHE* SPECIES IN MELONS IMPORTED FROM CENTRAL AMERICA**

**Matt Broge, Charlie L. Biles, Alisha Howard, & Keshav Karki**, East Central University, Department of Biology, Ada, OK

**Benny D. Bruton**, United States Department of Agriculture, Agricultural Research Service, Lane OK

Phomopsis rot of melon fruit (*Cucumis melo* L. var. *cantalupensis* Naudin) is caused by fungi of the *Diaporthe* species. Plant pathogens such as *Diaporthe* spp. enter the surface of the melon fruit early in development and remain latent until fruit maturity. While ripe fruit is harvested and imported with no external evidence disease, internal fruit rot from *Diaporthe* spp. becomes evident as the fruit matures. The objective of this study was to characterize pathogenic *Diaporthe* spp. in melon imported from Central America. Isolates were cultured from sunken surface lesions from melons imported from Costa Rica, Honduras, and Guatemala. Fungal pycnidia and spores were examined microscopically to separate *Diaporthe* spp. from other fungi. Deoxyribonucleic acid (DNA) was extracted from fungal hyphae. Primers slightly inset of the traditionally barcoding ITS1 and ITS4 primers were used in the DNA amplification reaction. Purified polymerase chain reaction (PCR)



products were sent for Sanger DNA Sequencing.

Four *Diaporthe* spp. were isolated from melons imported from Guatemala, six *Diaporthe* spp. isolates were found in melons imported from Costa Rica, and none were isolated from melons imported from Honduras. Three of the Costa Rican isolates were similar in spore type to *D. melonis* and *D. ueckerae*, and three were similar to *D. sojae* and *D. curcurbitae*. Three of the Guatamalan isolates were also similar in spore type to *D. sojae* and *D. curcurbitae* and one was similar in spore type to *D. melonis* and *D. ueckerae*. Sequencing analysis demonstrated that one of the isolates was a 100% match of 509 base pairs for *Phomopsis* sp. ENS505 (Sequence ID: KM977662.1), a *Phomopsis* species native to Panama. Of note, this species of fungi is currently taxonomically classified as belonging to the *Valsaceae* family versus that of the *Diaporthaceae* family. However, genetic analysis of the fungi demonstrated marked resemblance to *D. melonis*

Isolation and characterization of pathogenic *Diaporthe* spp. from Panama in melons imported from other Central American countries suggest that plant pathogens are carried across international borders and imported into the United States. Further, the Valsaceae family classification of a species with a marked genetic resemblance to a Diaporthaceae family member suggests the need to reconsider current taxonomic classification of this group of fungi.

## HTLV-1 PROMOTOR COMPLEX TAX/PCREB INTERACTION WITH MED15 “KIX-LIKE” BINDING DOMAINS

**Josh Hardage, Morgan Mackey, & Alisha Howard** Department of Biology, East Central University, Ada, OK

Human T-Cell Leukemia Virus type 1 (HTLV-1), is a retrovirus that has been shown to cause adult T-Cell leukemia/lymphoma (ATLL) or HTLV-1-associated myelopathy (HAM) in approximately 5% of infected individuals. Tax, an HTLV-1 encoded transcription factor, recruits host CREB to the viral promoter. CREB, a transcription factor found to activate a large number of genes, becomes active when phosphorylated at serine 133 (pCREB). Tax promotes recruitment of pCREB to the HTLV integrated promoter at enhancer sites known as viral CREs. Together the Tax/pCREB/promoter DNA complex then recruit the ubiquitous host coactivator paralogs p300/CBP to the HTLV-1 promoter, leading to high transcriptional activation of the provirus. The KIX domain of CBP/p300 has been identified to interact with Tax and pCREB through two separate binding pockets. This interaction is believed to be the main interaction tethering the coactivator to the viral promoter. Interestingly, several so called “KIX-like” domains have been recently identified through structural and functional analysis. One such KIX-like domain has been proposed to reside in a mediator subunit known as MED15 or ARC105. We are investigating possible interaction between the Tax/CREB activator complex and the KIX-like domain of MED15 in order to determine whether Tax may recruit other transcriptional coactivators, such as the mediator complex, to the HTLV promoter.

## ADHERENCE TO PEDIATRIC GUIDELINES FOR THE DIAGNOSIS AND MANAGEMENT OF ACUTE OTITIS MEDIA

**Aaqil Shihab, Meredith Proctor,** Oklahoma State University Center for Health Sciences, Tulsa, OK

**Krista S. Schumacher, & Shrie Raam Sathyanarayanan,** Oklahoma State University Center for Health Sciences & Oklahoma State University Center for Health Systems Innovation, Tulsa, OK

**William D. Paiva,** Oklahoma State University Center for Health Systems Innovation, Tulsa, OK

Acute otitis media (AOM), or ear infection, is one of the most common reasons for children to be prescribed antibiotics. Doctors may tend to overprescribe antibiotics for AOM, and there has been

much debate over whether steps are being taken to address this issue. Overprescribing antibiotics is a problem because after a certain period of time the targeted bacteria strain can become resistant to the antibiotic, rendering it useless. In June 2004, the American Academy of Pediatrics released AOM treatment guidelines that included a recommended observation period of 48-72 hours for children with non-severe AOM or uncertain diagnosis. Our objective was to determine if the establishment of clinical quality standards had an impact on the prescribing rates of antibiotics for AOM treatment among children from infancy to age 12. Using data from the Cerner Health Facts data warehouse of electronic medical records, we conducted chi-square analyses on over 200,000 patient encounters to compare antibiotic prescription rates before and after guidelines for teaching/non-teaching hospitals and for urban/rural hospitals. We found teaching hospitals to be half as likely as non-teaching hospitals to prescribe antibiotics after guideline implementation. Although antibiotic prescribing rates decreased for urban hospitals post guidelines, rates increased for rural hospitals. These findings suggest that efforts targeting non-teaching and rural hospitals may be needed to increase awareness of AOM treatment guidelines and the risks of overprescribing antibiotics. Further research is needed to more fully understand the factors contributing to differential antibiotic prescribing patterns for children suffering from AOM.

#### **SPATIO-TEMPORAL VARIATIONS IN MIRNA, MRNA AND PROTEIN EXPRESSION IN PERIPHERAL NERVE INJURY**

**Yerokhin, Vadim, Das, Subhas, Miller, & Kenneth**, Oklahoma State University, Center for Health Sciences, Tulsa, OK

Peripheral nerve injury (PNI) affects approximately 20 million Americans annually, costing the healthcare system over \$150 billion each year. Although current therapies attempt to promote nerve regeneration, only 50% of persons fully regain motor and sensory function. Injured peripheral axons can regenerate, but this is rarely complete due to the slow rate of regeneration. Clearly, a new therapeutic approach for accelerating peripheral nerve regeneration is needed. Although miRNA and anti-miRNA therapy has proved fruitful in normalizing dysregulated protein expression in other diseases, clinical use of this therapeutic modality in pain and PNI has yet to be realized. The absence of translational application of miRNA therapeutics stems mostly from our limited understanding of the molecular mechanisms underlying nerve injury and regeneration. Because nerve regeneration requires a complex coordination of finely regulated events, understanding these molecular mechanisms is key for designing an effective bio-pharmacological intervention. In this study, we present novel findings of spatial and temporal expression of miRNA let-7a and 23b post-PNI in the spinal cord (SC), and elucidate their relationship with Nerve Growth Factor (NGF) and Glutaminase (GLS) expression. Sciatic nerve crush injury was performed in male adult rats. Lumbosacral SC was divided into 4 quarters and miRNA let-7a and 23b, NGF and GLS mRNA expression was measured at 1, 4 and 7 days. Expression in partial SC section was compared to the whole SC. Spatio-temporal patterns of miRNA, mRNA and protein expression were detected in partial sections of the SC, as well as the whole SC, suggesting presence of site-specific expression changes. These findings shed light on the molecular relationship during PNI, contributing to the knowledgebase required for the development of a novel therapeutic approach to peripheral nerve injury and regeneration.



## **PRELIMINARY STUDY: APPLYING OSTEOPATHIC MANIPULATIVE TECHNIQUES IN REDUCING SOFT TISSUE ABUSE IN VOCALISTS**

**Breanna Anderson & Susan Goldman-Moore**, University of Tulsa School of Music, Tulsa, OK  
**Kent Smith**, Oklahoma State University Center for Health Sciences, Office for the Advancement of American Indians in Medicine and Science, Tulsa, OK

**Leslie Ching**, Oklahoma State University Center for Health Sciences, OMM Department, Tulsa, OK

Osteopathic Manipulative Medicine may prevent vocal abuse and contribute to the overall health of the soft tissues associated with singing. Many singers are treated by physicians for ailments they develop over the course of their singing career (i.e. polyps, cysts, nodules, ulcers). These conditions can be mild to severe and create difficulties in a singer's life that may lead to phonomicrosurgery and post-surgery vocal therapy. Although this is a successful treatment, less invasive and preventive methods, such as osteopathic manipulation, would benefit the singer and produce a longer and more productive singing career. Singing improperly or for long durations can result in straining of the vocal folds and tension near the hyoid bone in the neck. Thus, select osteopathic manual manipulations may be advantageous in diagnosing and treating patients suffering from muscle tightness or joint strain. Herein, we will study the effects of select osteopathic manual manipulation techniques that decrease tension in the neck and shoulders and their effectiveness in contributing the overall health and performance of vocalists.

## **ECOLOGICAL ASSESSMENT OF NUTRIENT AVAILABILITY IN SUBTERRANEAN STREAMS TO DETERMINE HABITAT SUITABILITY FOR CAVEFISH IN THE ARBUCKLE MOUNTAINS, OKLAHOMA**

**Kevin W. Blackwood, Britney J. Temple, Stacy I. Blackwood, Laine A. Sanders, & Kaitlyn S. Beard**, East Central University, Ada, OK

The Arbuckle Mountains ecoregion is underlain by thick sequences of carbonate rock, which has undergone significant karstification and cave development. The anisotropy of the karst groundwater flows is largely controlled by fracture networks and cave systems with a dominating lateral component near the water table. Surface derived nutrients are carried by flowing water into the cave systems primarily through inputs such as ponors and sinkholes, but also from leaching through discrete fractures. Nutrient availability is dependent on many factors such as basin characteristics, season, precipitation and discharge, as well as anthropogenic activities. Cavefish are rare in Arbuckle Mountain caves, known only from the largest and most studied cave systems. However, lesser known cave systems, discovered more recently, may have the potential to host a suitable habitat with sufficient nutrient availability to constitute a food web that may sustain populations of cavefish. This investigation uses cave streams with known cavefish populations as analogs to assess various parameters, such as nutrient availability and discharge, as well as abundance of prey in determining the conditions most suitable for cavefish habitat. These results may be used as a baseline to determine whether other Arbuckle Mountain cave systems might host cavefish populations, which may then be further investigated using environmental DNA sampling.