# ABSTRACTS OF THE 113TH OKLAHOMA ACADEMY OF SCIENCE TECHNICAL MEETING NOVEMBER 1, 2024 UNIVERSITY OF OKLAHOMA HEALTH SCIENCERS CENTER, OKLAHOMA CITY, OKLAHOMA

(sorted by presenter's last name)

## A STUDY OF THE HIGH TEMPERATURE REACTION OF TITANIA, SILICA, AND YTTRIA

**Hunter Allen and Dwight Myers**, East Central University

The objective of this research is to investigate and catalog how titanium and silicon oxides ($TiO_2$, $SiO_2$) react when a ternary (third) metal is introduced at high temperatures. Previous work in this group confirmed that $TiO_2$ and $SiO_2$ do not react with one another at high temperatures. It is well known however that adding a third metal oxide can initiate a reaction between titania and silica at high temperatures. One example is the reaction caused by adding calcium oxide to form titanite ($CaTiSiO_5$). Our current ternary metal under investigation is yttrium. Other metals may be included in this study given an adequate time frame. Mixed oxide samples have been heated in a furnace at 1300°C. Sample characterization has been performed by X-ray diffraction. Results to date will be presented.

## EXPLORING THE EXPRESSION PROFILE OF HIPSC-BMECS FROM MULTIPLE SCLEROSIS PATIENTS IN A BULK-RNASEQ DATASET

**Evonn Darkoaa Annor,** Oral Roberts University

**Outstanding Undergraduate Paper in Biomedical Sciences**

Multiple Sclerosis (MS) is a chronic disease affecting the central nervous system, where the immune system mistakenly attacks the myelin sheaths of nerve fibers, leading to slower nerve impulses, nerve damage, and signal distortion or blockage. A key feature of MS is the disruption of the Blood-Brain Barrier (BBB), which includes brain microvascular endothelial cells (BMECs). Developing BMEC lines can model healthy and diseased BBB conditions, facilitating the study of inflammatory changes. One such application of this is used in this experiment where hiPSC-derived BMECs and MS hiPSC-derived BMECs were developed using a new protocol. In this study, datasets of healthy BMECs and MS BMECs under normal and stimulated conditions (4 hours with TNF/IFN-γ) were examined. Additionally, healthy cells (HC) under normal and inflammatory conditions were also compared due to the importance of understanding cellular processes under inflammatory conditions. The datasets were reformatted for RStudio and organized in CSV files. These values were processed in the Integrated Differential Expression and Pathways Analysis (IDEP) to generate visualizations. DESEQ2 outputs were further analyzed in RStudio using various R packages including Bioconductor and clusterProfiler. Public data records were compared to primary and iPSC-derived BMECs, analyzed in IDEP to determine enrichment, and in GEO2R to generate visualizations and identify differentially expressed genes. Raw counts of healthy cells under normal and inflammatory conditions were placed in the Nucleic Acid Sequence Analysis Resource (NASQAR) to visualize differential expression of these groups. RStudio visualizations were compared to public datasets, showing differing enrichment patterns. The differential expression of MS and HCs revealed regulation of leukocyte chemotaxis and vascular smooth muscle cell proliferation were prominent. In inflammatory conditions, adaptive immune response, leukocyte mediated immunity and lymphocyte mediated immunity were also shown to be significant. These iPSC-derived BMECs do capture the key features we hope to see in primary BMECs.

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## DESIGN AND MANUFACTURE OF A VERTICAL AXIS WIND TURBINE FOR THE UNIVERSITY OF CENTRAL OKLAHOMA SCHOOL OF ENGINEERING MAKERSPACE

**Nelson Clements, Zeb Jandt, and Ben Drumm,** University of Central Oklahoma

**Outstanding Undergraduate Paper in Engineering Sciences**

The UCO School of Engineering has expressed the desire to install a functional and aesthetic wind turbine on the roof of the new Makerspace building as a multi-purpose tool for recruiting new students, educating students on the increasingly important field of renewable energy, and to demonstrate the advanced manufacturing capabilities of the department. Wind energy production is particularly relevant to UCO graduates as wind energy provides the largest share of Oklahoma's net energy production and Oklahoma ranks third overall among all states in total amount of wind energy produced in the nation. Through research of the existing ideal vertical axis wind turbine design parameters and the use of rapid prototyping, this project will produce a small-scale prototype wind turbine and investigate the methods of production for a full-scale turbine. This project utilizes an axial flux generator to produce AC electric power which is rectified and stored in a large battery bank. Findings show that the most effective blade design utilizes a scale that is unfeasible in smaller prototypes, and therefore we must adjust our blade design to be an appropriate size. We have also found the small-scale vertical axis wind turbine in question does not have a large enough area to capture a sizable amount of energy from the wind, so the limitations must be kept in consideration. Utilizing a combination of design ideals from cutting-edge research publications, this vertical axis wind turbine combines aesthetic and efficiency considerations to result in a functional device to represent the School of Engineering.

## REAL TIME AUDIOBOOK CREATOR

**Annalise Dorety, Kien Nguyen, and Cobey Hixon,** University of Central Oklahoma

**Outstanding Undergraduate Poster**

15% of all Americans are dyslexic, which impairs their ability to effectively use written information. The inability to keep up with peers creates a gap between students which takes years of specialized learning to correct. With the Real Time Audiobook Creator, listeners would be given a new chance to not only learn; but, add their findings to any subject. A small camera set up on a headband apparatus would scan the open page of a book or any text. Next a script would be created where an AI voice would output a humanistic sounding audio clip. A small earbud would connect to the user's ear creating a more discrete experience. Once all of the text on a page has been read, a soft sound will indicate the need for turning to the next page. Our product could be mass produced and sent to schools across the United States to create alternative and more inclusive learning experiences. Children learning to read would always have someone to read to them. People learning the English language would get a real time phonetic example of words and phrases. Those who develop or already have blindness would get the ability to experience the joy of reading a new book. These and so many others would have the resources to learn like neurotypicals or people with unimpaired vision do every day. With our product every article, essay, storybook, novel, textbook, and paper would become instantly available to anyone that wishes to learn.

## FLUORESCENTLY LABELED UROPATHOGENIC E. COLI AS A WAY TO STUDY PATHOGENESIS

**Victoria Espinoza[1], Tram-An Ho[2], Alejandro Lopez[1], and Janaki Iyer[1],** [1]Northeastern State University; [2]Tulsa Community College

**Outstanding Undergraduate Paper in Microbiology**

Bladder cancer is the fourth most common cancer among men in the United States. The five-year survival for carcinoma in situ bladder cancer is 97% but this rate dramatically drops to 8% when the cancer becomes metastatic. Surgery, chemotherapy, and radiotherapy are common treatment options but more bladder cancers are becoming resistant to some of these strategies, thus highlighting the need for new therapies. Uropathogens are organisms that infect different organs of the urinary tract including the bladder. We previously found that *E. coli* strain CFT073 causes dramatic changes to bladder cells' shape indicative of cell stress and death in bladder cancer cells. To gain more insight into this process, we want to characterize the interactions of *E. coli* strain CFT073 with bladder cancer cells. We hypothesize that *E. coli* strain CFT073 adheres to bladder cancer cells resulting in cell death of bladder cancer cells. To test this hypothesis, we made chemically competent *E. coli* CFT073 and transformed a pGFP, a plasmid bearing the GFP gene. The expression of GFP in the bacteria was confirmed by fluorescence microscopy and we are now comparing the properties of fluorescently labeled *E. coli* CFT073 with untransformed *E. coli* CFT073. We will evaluate if the fluorescently labeled *E. coli* CFT073 can cause morphological changes to bladder cancer cells upon infection and determine the adherence to bladder cancer cells by confocal microscopy. Our findings will aid us in understanding how *E. coli* CFT073 causes damage to bladder cancer cells and enable us to identify factors produced by *E. coli* CFT073 that can be used as potential therapeutics.

## ISOLATION AND IDENTIFICATION OF TWO NOVEL GENERA CAPABLE OF BREAKING DOWN TWO ANTHROPOGENIC CONTAMINANTS FROM LOCAL WASTEWATER

**Jacobey King, Sam Miller, Nam Lu, Ralph Tanner, and Paul A. Lawson**, University of Oklahoma-Norman)

As annual human production and intake of synthetic compounds surge alongside an ever-growing industrialized world population, anthropogenic contaminants have become harder to ignore. Some of these, such as sucralose, are relatively unchanged by their passage through wastewater treatment plants and make their way into distribution system water. Research into the impact of sucralose on human health has revealed mounting concerns, particularly about products formed under thermal degradation. The ability to break down two contaminants, sucralose and nitrilotriacetic acid, is rare among bacteria yet does happen at a quantifiable magnitude in wastewater. Which members of the community are undertaking this natural bioremediation is largely nebulous, with anaerobic degradation of sucralose being undocumented entirely. Taking great care to create enrichments where microbial communities from wastewater are forced to break down sucralose or nitrilotriacetic acid as the sole substrate allows for the eventual identification of microbes which are capable of this catabolism. Anoxic enrichments with the described conditions were conducted on a wastewater inoculum. Subsequent isolation yielded three strains of two novel species belonging to two novel genera, as assessed through a polyphasic approach. Strains 9ST and NTA5 are Gram-negative-staining rods which make up two closely related strains of a bacterial species able to grow on a meticulously crafted medium featuring sucralose as the sole substrate, and belong to the proposed taxon *Purgationimicrobium sucraloseivorans* gen. nov. sp. nov. located in the family Azonexaceae. Strain NTA1T is a Gram-positive-staining coccobacillus comprising the proposed taxon *Quisquiliimicrobium normanense* gen. nov. sp. nov. located within the family Actinomycetaceae.

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## ELUCIDATING THE EFFECTS OF DOWNREGULATION AND OVEREXPRESSION OF CELL WALL BIOSYNTHESIS GENES ON STOMATAL DYNAMICS

**Qimeng Li, Dr, Petrik, Brant Osbone, Maricela Espinosa,** Northeastern State University

**Outstanding Graduate Poster**

Stomata, which are tiny pores on the surfaces of plants, allow intake of carbon dioxide for photosynthesis and release of water vapor for evaporative cooling. In grass plants, stomata are composed of two guard cells flanked by two subsidiary cells. To gain a better understanding of the stomata (guard and subsidiary cells), eleven cell wall biosynthesis genes that are expressed in stomatal cells of *Brachypodium distachyon* are being studied. These genes are involved in cellulose (CESA1, CESA3, CESA6), xylan (GT43B2, XAX1a/1b, GUX1, GUX2, GUX1/2, TBL29), and pectin (GAUT1, GAUT4) synthesis. Artificial microRNAs targeting each gene are being cloned into constructs under the expressional control of guard or subsidiary cell-specific promoters, allowing a decreased expression of each targeted gene by RNA interference. For overexpression of these genes, cDNAs of 7 essential genes will be PCR amplified from WT *Brachypodium distachyon* or synthesized by Thermofisher, followed by their cloning into overexpression constructs. Positive clones are identified by restriction enzyme digestion and DNA sequencing before being transformed into *Brachypodium distachyon*. These clones will be transformed using different methods of *Agrobacterium tumefaciens*-mediated plant transformation, such as the cut seed method or the callus method. Adult transgenic plants will then undergo a series of tests to identify stomatal differences between the transgenic lines exhibiting decreased expression of cell wall biosynthesis genes and wildtype control plants. Currently, stomata cell walls in plants have not been thoroughly studied. Through these experiments, we can better understand why the stomatal cells of plants show a faster response and rate of stomatal opening and closing than dicot plants, whose cell walls differ in chemical composition. This may allow the development of cereal crop plants with greater heat and drought tolerance.

## CULTIVATION OF FASTIDIOUS ANAEROBIC BACTERIA ON CLARIFIED GUANO FILTRATE SUPPLEMENTED MEDIA

**Nam Lu[1], Elizabeth Walker[1], Amber Nguyen[1], Jacobey King[1], Samuel Miller[2], and Paul A. Lawson[1],** [1]The University of Oklahoma-Norman; [2]Oklahoma State University-Stillwater

Cultivation an essential tool for microbiology that provides access to the characterization of an organism's morphological, biochemical, physiological and chemotaxonomic traits. Although bats account for ~21% of mammal species, only a small fraction of all microorganisms have been identified and described, and even fewer have been successfully recovered from bat guano. In this study, a culture-dependent approach will be used to grow anaerobic fastidious organisms using a clarified guano filtrate supplement to aid in the recovery and identification of novel bacteria from bat guano. Often, bacteria fail to grow due to the lack of specific growth factors and substrates. Clarified guano filtrate supplementation will provide vital nutrients from the guano that further increasing the probability of continued growth when transferred to a range of different substrates. Guano filtrate supplemented media will then be inoculated with diluted guano sample and grown under anaerobic conditions. Candidate novel isolates (under 97% 16S rRNA sequence similarity) identified will have whole genome sequencing and be subjected to a panel of phylogenomic analysis, morphological, biochemical, physiological and chemotaxonomic (fatty acid, polar lipids, peptidoglycan). We envision that underrepresented microbes in bat guano will be further characterized and studied to understand key mechanisms in biogeochemical cycles.

## ENVIRONMENTAL AND ANTHROPOGENIC EFFECTS ON TERRESTRIAL MAMMAL RICHNESS IN OKLAHOMA CITY METRO AREA

**Chloe Lucas and Daniel G. Rocha**, Southern Nazarene University

Urbanization is growing world-wide, and particularly in North America, posing challenges for wildlife. We investigated factors that affect wildlife distribution in the highly urbanized Oklahoma City (OK) Metro area to understand the relative importance of habitat quality, presence of domestic animals, or human activity intensity on wildlife, using medium-large terrestrial mammals as a model taxon. Here we report preliminary data on 21 camera trap sites (active for ~78 days during Summer of 2022 and 2023), in combination with site covariates (summer and winter NDVI, road intensity and number of domestic records) collected in a 250 m radius buffer around the camera locations. We used Poisson Generalized Linear models (GLM) to test the effect of site covariates on mammal species richness. Except for larger predators (i.e., black bear, cougar), we detected most mammal species expected to occur in the region. Sites varied greatly in species richness (3-9), being the white-tailed deer and the skunk the most and least detected species respectively. The summer NDVI model was the top ranked, followed by the winter NDVI model, suggesting that habitat quality, expressed in higher vegetation cover, positively influences mammal distribution in the study area. Data collection in the summer of 2024 and the inclusion of other covariates (e.g., habitat connectivity and human population density) will help us further understand the factors that influence mammal distribution in urban environments.

## AN EXAMINATION OF THE EUTROPHICATION STATUS OF HAPPY LAKE IN CLAREMORE, OK

**Ashli Mansour Ahmed Mohamed[1] and Chayanne Olson[2],** [1]Rogers State University; [2]Northeastern State University

Cultural eutrophication is one of the most significant water quality issues worldwide. It occurs when water bodies, like lakes, become overloaded with nutrients, often from human activities, leading to harmful algal blooms (HABs). This process can severely impact ecosystems, causing low dissolved oxygen levels and mass fish die-offs. Cultural eutrophication affects millions of lakes and reservoirs globally and can lead to the premature decline of these water bodies. Claremore Lake in Rogers County, Oklahoma, serves as a drinking water source for the city of Claremore and is classified as impaired due to high chlorophyll concentrations, indicating hypereutrophic conditions. This study focuses on the contributions of nitrogen and phosphorus from Happy Lake. Happy Lake is a reservoir, constrained by an unmanaged rock and a concrete spillway constructed between 1953 and 1957, that feeds into Claremore Lake, particularly after rain events. Between April and August 2024, we examined water quality parameters— pH, oxygen, nutrient concentrations, and algal particles—at five sites along the gradient from Happy Lake to Claremore Lake. Results showed that Happy Lake exhibited greater fluctuations in nutrient levels, oxygen, and algal particles compared to sites deeper in Claremore Lake. This data is crucial for managing Claremore Lake's water quality and understanding nutrient sources. Future research should investigate the major nutrient inputs from northern tributaries, especially the upper portion of Dog Creek.

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## AN EXPLORATORY SURVEY OF DUNG BEETLES (COLEOPTERA: SCARABAEOIDEA) IN THE OKLAHOMA PANHANDLE

**F.D. Noahubi[1], M.J. Cherry[2], M.C. Chitwood[3], M.M. Dart[2], R.W. DeYoung[2], W.S. Fairbanks[3], D.P. Hahn[3], L.J. Heffelfinger[2], R.C. Lonsinger[4], C.M.J. Rickels[2], E.P. Tanner[2], M.T. Turnley[3], and H.G. Wang[1],** [1]East Central University; [2]Texas A&M University-Kingsville; [3]Oklahoma State University-Stillwater; [4]U.S. Geological Survey, Oklahoma Cooperative Fish & Wildlife Research Unit

Dung beetles potentially provide important ecosystem services in parasite control and nutrient cycling. Yet, little is known of the community composition of dung beetles in the Oklahoma panhandle. In June 2024, we sampled dung beetle assemblages using pitfall traps at four locations in Cimarron County, Oklahoma. The pitfall traps were arranged in a single transect at each location and baited with cattle dung. We checked the traps daily for four days and recorded the density and morphospecies of beetles collected in them. The traps were refilled with the baited dung as needed. A selected sample of the beetles collected were prepared into specimens and returned to East Central University to be labeled and photographed. We recorded a total of XXX beetles representing YYY morphospecies during the four-day sampling effort. There were noted differences in the distribution of dung beetles between the sampling locations. The pastures that were grazed by cattle at the time of sampling had a higher abundance of beetles but were dominated by a few species. The pastures lacking cattle grazing had fewer beetles overall but a higher diversity of beetle species. Our results suggest that land use can impact the community structure and abundance of dung beetles. One potential drawback of our study is that only cattle dung was used as bait. Future research should incorporate a variety of fecal material as bait to assess their difference in attracting dung beetles.

## EFFECTS OF IN OVO CHRYSENE AND PHENANTHRENE EXPOSURE ON CHICKEN EMBRYO DEVELOPMENT AND CARDIAC FUNCTION: IS THERE EVIDENCE FOR SYNERGISM?

**Yulianis Pagan, Hallum Ewbank, and Christopher Goodchild,** University of Central Oklahoma

**Outstanding Undergraduate Paper in Applied Ecology & Conservation**

Polycyclic aromatic hydrocarbons (PAHs) are naturally occurring toxic chemicals found in crude oil and are known to transfer from the external eggshell surface to egg contents. Previously, we conducted an egg-injection study with White Leghorn chicken (*Gallus gallus*) eggs and identified two PAHs, chrysene (Chr) and phenanthrene (Phe), that increased embryonic heart mass and decreased embryonic heart rate. In this study, we investigated whether co-exposure to Chr and Phe resulted in additive or synergistic effects on chick embryo development. Chicken embryos were exposed to Chr (800 ng / g of egg mass), Phe (800 ng / g egg mass), and Chr and Phe in combination ($\sum$ PAH 1600 ng /g ng egg mass) via egg-injection, and we collected embryonic organ mass, heart rate, metabolic rate, and cardiac and hepatic mRNA expression of detoxification enzymes on embryonic day (ED)18. We observed a decrease in ED 18 heart rate across all treatments. We also saw an increase in ED 18 liver mass in eggs exposed to Chr and Phe simultaneously, and shifts in metabolic rate and mRNA expression of cardiac and hepatic detoxification enzymes. However, embryonic growth or morphology did not vary among treatments. Collectively, these data suggest in ovo exposure to PAHs may lead to congenital heart defects, which may have long-term implications for hatching success and hatchling survival.

## IL7R MUTATION GENERATED IN HEMATOPOIETIC STEM CELLS VIA CRISPR/CAS9 TO DEVELOP HUMANIZED MOUSE MODEL OF B CELL ACUTE LYMPHOBLASTIC LEUKEMIA

**Natalia Ramirez,** Oral Roberts University

**Outstanding Undergraduate Paper in Biochemistry & Molecular Biology**

B-cell acute lymphoblastic leukemia (ALL), a hematologic disease characterized by an extensive proliferation of immature B cell precursors, is the leading cause of cancer-related deaths in children. Philadelphia chromosome-like B-ALL, which encompasses 15% of childhood ALL is associated with a high risk of relapse and poor outcome. One of the most frequently mutated genes involved in Ph-like ALL is interleukin 7 receptor (IL7R). Current models available for the study of Ph-like ALL are inadequate to fully recapitulate human leukemic development. Therefore, this study focuses on the creation of a humanized model for Ph-like ALL. Four different guide RNAs (gRNAs) were designed to target the IL7R gene, and homology directed repair (HDR) donors were established to replicate one of the most common IL7R mutations observed in B-ALL patients. A subpopulation of primary hematopoietic stem cells was selected via flow cytometry and edited via CRISPR-Cas9 with gRNAs and HDR against IL7R, achieving an IL7R mutation efficiency of 54%. IL7R edited cells were injected into mice after which they were allowed to engraft during a period of 12 weeks. IL7R edited cells kept in culture were selected for CD34+ expression and subjected to mutation analysis. Future directions include flow cytometry analysis and genotyping of the populations emerging from these mice which will determine whether or not an in vivo preleukemic model was created. In conclusion, this work successfully achieved the introduction of an IL7R mutation in human primary hematopoietic stem cells to develop a humanized mouse model of Ph-like B-ALL.

## MOSQUITO-BORNE DISEASE SURVEILLANCE IN OKLAHOMA (MODSO)

**Pranav Rao, Lillian Savage, Israel Gentry, Margaret Wojan, Aydin Read, and Caio Martinelle França**, Southern Nazarene University

Central Oklahoma is an ecologically diverse region in the southern Great Plains, and it is crucial to identify potential nidi of infection; the spatiotemporal distribution of mosquitoes, where they can acquire pathogens, and their ability to transmit pathogens to hosts. We conducted mosquito surveillance during the early (May to July) and late (August to October) seasons in 2024 using adult host-seeking CDC Light and BG - Pro traps baited with CO2 as well as CDC's gravid traps baited with rabbit food pellets (0.250 lbs/gal). Female adult mosquitoes were sorted and identified to species using morphological keys; known vectors of disease were pooled by site, date of collection, and species containing 5-30 individuals. Purified nucleic acids from the pools were tested for the presence of West Nile Virus (WNV) and Saint Louis Encephalitis virus (SLEV). We sampled 17 trapping sites across three Oklahoma counties and generated more than 300 unique trapping events and collected approximately 12,200 mosquitoes from thirty one species representing 5 genera. *Culex pipiens* complex, which is one of the major WNV vectors, was the most abundant species, making up 54.4% of the total mosquito community. Other prominent regional species included *Aedes vexans* (10.6%), *Culex erraticus* (10.6%), and *Aedes albopictus* (6.0%). Singleplex TaqMan reverse transcription-quantitative polymerase chain reaction (RT-qPCR) assays detected WNV in 4.3% (12/279) and SLEV in 2.5% (7/279) of the mosquito pools. Statistical analysis such as analysis of similarities (ANOSIM) and non-metric multidimensional scaling (NMDS) will also be utilized to gauge the spatiotemporal relationship between the species that make up the mosquito community, their seasonality and land cover characteristics of the region sampled. Understanding the dynamics of the mosquito population has the potential to prioritize public health resources and inform mitigation strategies to combat mosquito borne diseases.

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## DETERMINING DIVERGENCE ONE STEP AT A TIME

**Trevor Rauch[1], Dysen House[1], Lindsey J. Long[1], and Laura Reed[2],** [1]Oklahoma Christian University; [2]Genomics Education Program-University of Alabama

**Outstanding Undergraduate Paper in Biological Sciences**

The Insulin/Tor pathway in *Drosophila* is a signaling pathway that serves to control metabolism and growth. Genes along this pathway evolve at different rates due to the property of conservation. Two genes along different points in the signaling pathway, slmb and step, were compared to see how conservation varies for genes at different points along the pathway, as well as different levels of gene interaction. The two genes were annotated and sequenced throughout different species of *Drosophila*, and their divergence score was calculated. The divergence score was based on the similarity of the target gene to the baseline species, *D. melanogaster*, and the similarity of the genes surrounding the target gene. Due to the early location of slmb in the pathway and high connectivity to other genes, we hypothesized that it would be more conserved than step, which comes later in the pathway and is connected to fewer genes. Our annotation data as well as data from classmates led to the conclusion that generally, slmb is more conserved than step across different *Drosophila* species.

## A NOVEL MICROBIAL BIOTHERAPEUTIC FOR MODULATION OF THE GUT-LIVER AXIS

**Gwen Reilly and Crystal N. Johnson**, Oklahoma State University-Center for Health Sciences

The gut-liver axis (GLA) refers to the interaction between gut microbes and the liver. It functions to relay signals initiated by diet, genetics, and environmental stimuli via the hepatic portal vein to the liver and intestines. This feedback loop plays valuable roles in health such as nutrient secretion and absorption, dissemination of toxins, and maintaining gut and liver homeostasis. Disruption of the GLA contributes to conditions such as obesity, fatty liver disease, and chronic inflammation, which have become abundant among society. One potential intervention is through the use of next generation probiotics to alter the composition of our gut microbiome. Specialized anaerobic and enrichment techniques have facilitated the discovery of a previously uncultivated organism from the Erysipelotrichaceae family, a new bacterial genus tentatively called GR63. While little is known about this organism, genome mining has revealed information on its taxonomy, phylogenetic relationships, and functional abilities that suggest this microbe could serve as a probiotic therapeutic for the reversal of GLA pathogenicity. 16S rRNA gene sequencing has revealed a low nucleotide similarity (89.57%) to the nearest phylogenetic neighbor of GR63, *Dubosiella newyorkensis*. Previous microbiome studies have indicated *D. newyorkensis* is involved in several mechanisms related to improved health, including increased longevity and cognitive function. In silico data gathered from our genomic insights have also suggested involvement in the protection against non-alcoholic fatty liver disease (NAFLD). Further polyphasic characterization of this novel genus is currently underway. Future work will be aimed at elucidating the potential probiotic mechanisms of GR63 using animal models. With the potential to enhance clinical care, microbial therapies offer a targeted solution to improve the interconnectedness of the gut-liver axis for improved functionality as the future of precision medicine.

## ANALYSIS OF FISH DIVERSITY IN IMPAIRED STREAMS OF NORTHEASTERN OKLAHOMA

**Ashleigh Ross[1] and Cheyanne Olson[2]**, [1]Rogers State University; [2]Northeastern State University

The growth of industrial and residential areas in Oklahoma have led to an increase of urbanization around small streams. This has led to a decline in quality of freshwater habitat and in turn a degradation in the aquatic biotic integrity. Using biotic diversity as an indicator for both biotic integrity and habitat health is a common technique used to analyze freshwater ecosystems functioning. Freshwater fish may be used as an indicator for stream impairment since they are heavily affected by various water quality parameters, are long lived, and are well-studied. Several small, urbanized streams in Northeastern Oklahoma are understudied, but are listed on Oklahoma's 303d list for a variety of impairments (*E. coli*, nutrient levels, etc.). This study used a habitat survey and fish collection in several small, impaired streams in Northeastern Oklahoma as a reference for their ecosystem health. The fish assemblages were collected using a combination of electrofishing and seining. The results showed low scores when assessed using the Shannon-Weiner Diversity Index, Simpson's Index, and the Oklahoma Index of Biotic Integrity. Additionally, urban streams received lower habitat scores. This aligns with the impairments noted by previous study of these same sites. These signs of biotic and habitat impairment showcase a need for restoration and conservation efforts regarding these types of urban streams.

## OUT OF AFRICA: PALEONTOLOGICAL RESEARCH AND DISCOVERIES MADE WHILE RESIDING IN SOUTH AFRICA

**Christen D. Shelton**, Rogers State University

South Africa is known for its diverse fossil record spanning from the Paleozoic through to the Stone Age. I resided for two years in South Africa to study the animal group known as the Dinocephalians. This is a continuation of the paleohistological research started in Germany while investigating fibrolamellar bone (FLB) tissue in the basal mammal-like reptiles. Dinocephalians are a group of Therapsids (mammal like reptiles of Middle Permian that evolved from the Pelycosaurs of the Lower Permian). This work produced four publications showing results of consumptive sampling in *Anteosurus*, *Moschops*, *Keratocephalus*, *Struthiocephalus*, and *Jonkeria*. Findings revealed the vast presence of FLB which appears to be convergent in the mammalian line. This research revealed the first case of osteomyelitis in Dinocephalians. It has been previously discovered in *Pelycosaurs* and modern mammals. Additionally, participation in expeditions allowed further discoveries and contributions to South Africa's rich prehistory. I co-discovered half of a skull of one of the rarest dinocephalians, *Criocephalosurus*. The other half was found by the current curator of non-mammalian tetrapods at the London Natural History Museum. This discovery help extend the known biogeographic range of the *Tapinocephalus* Assemblage Zone from Abrahamskrall Formation up into the Teekloof Formation deposited when this land was part of Gondwana. Additionally, participation in two expeditions to KwaZulu Natal to recover fossil material of a rare Cretaceous sea turtle reported in the 1970's by an Ammonite researcher on the shores of St. Lucia Lake. This is the fourth known example of a dermochelyid turtle in all of the African continent. On the final expedition, the second known remains of a *Plioplatecarpine mosasaur* from South Africa were found. The first mosasaur fossil from South Africa was discovered in 1901. All fossil material is housed in the vertebrate paleontology collection of the Iziko Museum of Cape Town.

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## ECOLOGICAL DISTURBANCE IN THE ANTHROPOCENE: LEGACY EFFECTS OF ORPHANED WELLS ON METABOLIC PHENOTYPE OF FREE-LIVING RODENTS AND VEGETATIVE COMMUNITY

**Jess Warr, Richard Dolman, and Christopher G. Goodchild,** University of Central Oklahoma

**Outstanding Graduate Paper**

While catastrophic large marine oil spills often receive considerable media attention, smaller-scale inland spills occur much more frequently, resulting in legacy polycyclic aromatic hydrocarbon (PAH) contamination. Oklahoma currently has 15,965 documented orphaned oil rigs that were operated under less regulatory oversight. Oklahoma Energy Resources Board (OERB) is working diligently to plug orphaned wells. However, the toxic legacy effects on surrounding ecosystems are not well understood. Using two separate field sites in Payne County Oklahoma, we assessed site-specific disturbance by conducting vegetative surveys to generate Floristic Quality Assessments (FQAs) for each site. Further, we measured hematological damage, immune traits, and organismal metabolic rates in free-living deer mice (*Peromyscus maniculatus*) populations inhabiting sites with orphaned wells. Collectively, these data will allow us to evaluate the legacy effects of unplugged oil wells on the vegetative community and physiology of resident deer mice.

## IMPLEMENTING BREWERY QUALITY CONTROL UTILIZING SPECTROPHOTOMETRIC TECHNOLOGY

**Jamie Welsh**, Oklahoma City University

**Outstanding Undergraduate Paper in Physical Sciences**

In this independent research opportunity, a spectrophotometer was used to measure vicinal diketones (VDK), international bitter units (IBU), and standard reference method (SRM, color) for a variety of beer styles at Stonecloud Brewing Co. Each of these parameters is unique to style thus giving a beer its distinct flavor. For the process of packaging and presenting the products to the public, quality analysis is crucial to maintain the flavor, olfactory, and visual characters unique to each style. During the process of fermentation, yeast synthesize the amino acid valine. 2,3 butanedione and 2,3 pentanedione are secreted by-products of this synthesis known collectively as VDKs which impart a buttery flavor to beer. As fermentable carbohydrates decrease during fermentation, yeast reuptake VDKs and utilize them as an energy source. At Stonecloud, the purpose of this assay is to find the point at which yeast has metabolized VDKs to a level below the capacity of organoleptic sensation. Early detection of below threshold VDK levels allows beer to be crashed (chilled to 35□), transferred out of fermenters, and into brite tanks for packaging thus freeing up fermenter space and allowing increased production. The purpose of this research presentation is to present lab findings on VDKs to explain the assay, how the assay works, and the consequences if the parameter is out of range. Stonecloud's core beers will be highlighted in this project. Alongside the VDK protocol, other spectrophotometer protocols and future projects will be highlighted and discussed to reveal how absorbance technology can be incorporated in a local brewery setting.

## USING ULTRASOUND TO STUDY PROPERTIES OF RAW HONEY

**Karen Williams**, East Central University

Ultrasound is a non-destructive method of obtaining properties of raw honey. This study will obtain the velocity of 1MHz ultrasound waves through honey, the acoustic impedance of honey, and the acoustic attenuation coefficient of raw honey. Finally, water was introduced to the sample and tested to determine if adulterated honey could be detected easily. The velocity of raw honey was obtained using distance and time traveled. Velocity values ranged from 1830 m/s to 2030 m/s for a temperature range of 18.4 to 24.5 degrees C. The acoustic impedance is the product of the density times the velocity. The acoustic impedance was easily obtained using the mass and volume of the honey in the cell with the velocity obtained. Impedance ranged from 2.65 Marls to 2.94 MRayls. The acoustic attenuation of raw honey was obtained using a reflector block, the Gampt Echoscope, a 1MHz transducer, and Ascan software. The slope method (Williams, 2015) was used. The slope of the graph of attenuation in dB/ MHz versus the distance in mm is the acoustic attenuation coefficient. All were negative. They were -51.8, -147.5, -127.3, -45.69, and -57.77 dB/MHz mm for a temperature range from 18.1 to 24.5 deg C. Cooling overnight as a wider range of data was desired is thought to have caused the honey to crystallize; thus causing a wide range of acoustic attenuation values the next day (Jost and Peirong). It was very easy to tell from the velocity data the adulterated honey (18% water by volume) was not raw honey. The velocity of 1MHz ultrasound waves through the adulterated honey was 1590 m/s-far from the raw honey velocity values. This study shows promise in using ultrasound to accurately obtain properties of raw honey.

## A NOVEL APPROACH TO WEST NILE VECTOR IDENTIFICATION AND SURVEILLANCE

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Due to climate change, the risk of mosquito-borne diseases is increasing as mosquito habitats are changing. Our project aims to enhance the analysis of mosquito vector populations, specifically West Nile virus vectors, by developing a novel primer that can both amplify the DNA of multiple mosquito species and produce distinct products for each species that are visually distinguishable by gel electrophoresis. We are currently investigating if such sites exist within the mosquito genomes that a single primer set could both bind and amplify, giving products with enough size variation. We have designed and tested 20 unique primer sets in silico, but a functional, species-identifying primer set remains elusive. Despite this, the study establishes a foundation for future exploration using the proposed method. Future directions may involve multiplex PCR if a singular primer set is not found, and incorporating quantitative PCR to estimate species abundance in samples. We hope that, regardless of the success of our proposed methodology, our findings contribute to the advancement of mosquito population analysis techniques. As mosquito-borne disease threats intensify, the search for improved methods of vector population analysis remains crucial for public health.