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(sorted by presenter's last name)

A PRECIPITATION-DRIVEN MICROBIAL SHIFT: BACTERIAL VS FUNGAL CORRELATES OF CARBON STORAGE IN OKLAHOMA FORESTS

Rustem Fatih Albayrak, Oklahoma State University - Stillwater

Outstanding Graduate Poster

Forest soils constitute the largest terrestrial carbon reservoir, yet their stability under changing precipitation regimes remains a critical uncertainty in climate projections. While belowground microbial communities regulate carbon cycling, how precipitation alters the relative importance of bacteria versus fungi as drivers of carbon storage is poorly understood. This study tests the hypothesis that precipitation regime determines whether bacterial or fungal communities are stronger predictors of total ecosystem carbon storage. We leverage Oklahoma's pronounced precipitation gradient (400-1200 mm/yr) across 50 forest plots representing major vegetation types. Bacterial (16S rRNA) and fungal (ITS2) communities are being characterized through amplicon sequencing, while carbon stocks are quantified through forest inventories and soil organic matter analysis. Using Structural Equation Modeling, we are testing how precipitation moderates relationships between microbial diversity and carbon storage. We predict a systematic shift from fungal-dominated carbon storage mechanisms in high-precipitation eastern forests to bacterial-dominated mechanisms in low-precipitation western woodlands. This research will provide crucial insights into climate-microbe-carbon interactions and inform climate-resilient forest management strategies tailored to Oklahoma's diverse precipitation regimes.

MICROBIAL DARK OXYGEN PRODUCTION IN FRESHWATER AQUIFERS

Samikshya Giri, Adrienne Jones, Anna Rockwood, Todd Halihan, Lauren Haygood, and Sabrina Beckmann, Oklahoma State University - Stillwater

Microbial dark-oxygen production has recently been observed in marine and groundwater environments, carried out by ammonium-oxidizing archaea (AOA). These archaea oxidize ammonium to nitrite to meet their energy needs and are abundant in environments with high, very low, or depleted oxygen levels. Recent studies have shown that the ammonium-oxidizer *Nitrosopumilus maritimus* can produce oxygen and dinitrogen in the dark (Kraft et al., Science, 2022). In this study, we examine the microbiology, hydrology, and geochemistry of both a contaminated groundwater site and a non-contaminated site within the Arbuckle-Simpson Aquifer. The contaminated site exhibits varying levels of contamination with chlorinated compounds. Electrical Resistivity Imaging (ERI) indicated low bioactivity within the contaminated groundwater plume, which aligned with total cell counts ranging from $1.1\times10^{1}6$ to $9.1\times10^{1}7$ cells/mL, similar to those in the non-contaminated control well ($3.7\times10^{1}7$ cells/mL). 16S rRNA sequencing and quantitative PCR (qPCR) targeting bacterial, archaeal, and dehalogenase genes revealed that dehalogenating bacteria belonging to the phyla Chloroflexi and Deltaproteobacteria are present at very low abundances, below 1% of the overall microbial community. They are likely mostly inactive due to high oxygen levels and the groundwater's redox potential. Surprisingly, we detected an aerobic or facultatively anaerobic microbial community comprising bacteria and archaea, predominantly ammonium-oxidizing archaea (AOA). The microbial communities were dominated by *Nitrosopumilus* and *Nitrososphaera*, with relative abundances of up to 65% and 21% of the community, respectively, consistent with high abundances of ammonium-oxidizing genes (amoA). At the non-contaminated groundwater site, seven bacterial and archaeal species capable of dark oxygen production were identified in the aquifer. The pathways for dark oxygen production are not yet fully understood. Our results suggest that these microbes could raise the aquifer's redox potential, resulting in implications for the development of new electrode-monitoring systems and overall aquifer assessment strategies.

DIVERGENCE IS SIK3 OF *DROSOPHILA* SPECIES

Jadie Brister[1], Lainy Lewis[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 (Zoology)

This study investigated the evolutionary divergence of two genes, Salt-inducible kinase 3 (Sik3) and rolled (rl), across five species of *Drosophila*, using *D. melanogaster* as the reference. Both genes are part of the insulin/TOR signaling pathway, which regulates growth and metabolism. We hypothesized that Sik3 would be more divergent due to its metabolic role and potentially fewer constraints on its function. Gene annotation was performed using tools provided by the Genomics Education Partnership to build gene models, analyze protein sequences, and examine genomic neighborhoods. While Sik3 had lower sequence divergence scores, rl is considered functionally more conserved, likely due to its central role in signal transduction and interaction with many other proteins. These results suggest that gene conservation is influenced not just by how much a gene's sequence changes, but also by how critical its role is in cellular networks.

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FROM *FEROCACTUS* TO CORYPHATHA: THE COMPARATIVE ANATOMY OF EXTRAFLORAL NECTARIES IN THE TRIBE CACTEAE

Jackson Burkholder, Oklahoma State University - Stillwater

Extrafloral nectaries (EFNs) are specialized glands in plants that secrete an aqueous solution of sugars and amino acids. Unlike floral nectaries, which function primarily in pollination, EFNs are typically associated with plant defense, attracting invertebrates whose presence and activity can reduce herbivory. EFNs were first observed in the cactus family in 1837 and since the late 1890's it has been hypothesized that the EFNs of the tribe Cacteae represent highly modified secretory spines. Throughout the 20th century anatomical studies have been conducted on a small number of species, but the anatomy of these structures remains completely undocumented for many genera, and the comparative anatomy of EFNs across every genus in the tribe in which they occur has never been investigated. My study reaffirms the basic structure of these EFNs: a basal vascularized stalk filled with subnectary parenchyma topped with a broad secretory head of nectary parenchyma cells which secrete nectar through a ruptured cuticle. I provide additional evidence that they represent highly modified spines by proposing a classification system that shows a gradient of more spinelike characteristics to those that are more specialized for secretion. *Ferocactus*-type EFNs are the least specialized and have the most spine like characteristics, including their close association with the spines of areoles, loosely organized vascular tissue, and a secretory head that consists of fiber-like cells which elongate from an intercalary meristem. *Sclerocactus*-type EFNs are also associated with the spines of the areole but have a clavate secretory head devoid of fiber-like cells and a single ring of vascular tissue in the stalk. *Coryphantha*-type EFNs are the most specialized as they have a strongly capitate secrertory head without fiber-like cells, highly organized vascular tissue in a single ring of well-developed collateral bundles and are associated with the axillary extent of dimorphic areoles.

STEPS TO SUCCESS: HOW WELLNESS DRIVES FLOURISHING

Duoduo Cai, Emily Walz, Ella Howard, Kennedy Seggelke, Chloe Winkler, Myra Bloom, Scarlet Jost, Andrew Lang, Nancy Mankin, Philip Nelson, and Enrique Valderrama, Oral Roberts University

Outstanding Undergraduate Paper in Math, Computer Science, & Statistics

At Oral Roberts University, whole-person education is not just a value, it's a mission. Every student participates in a comprehensive health and physical activity program designed to nurture spirit, mind, and body. Over the past decade, our interdisciplinary undergraduate research group has investigated how wellness behaviors, especially physical activity, relate to academic performance, retention, and overall flourishing. Drawing on a large multi-year dataset, we find consistent evidence that students who maintain active, healthy lifestyles achieve higher GPAs and persist at greater rates, independent of background factors such as personality or socioeconomic status.

EVALUATING SOIL PHYSICAL PROPERTIES ON OKLAHOMA SOILS: THE ROLE OF BIOCHAR AMENDMENTS

MaKayla Friend, Jonathan Medellin, Nimalka Weerasuriya, and Benedicte Bachelot, Oklahoma State University - Stillwater

Outstanding Undergraduate Paper in Environmental Sciences

Promoting soil health and stimulating natural soil processes that have been depleted over time are the goal of current agriculture practices, including the use of organic amendments. Agricultural systems also heavily rely on the use of biocides, which could indirectly alter soil health. My aims of this study are (1) to evaluate the impacts of different biochar amendments on soil properties, and (2) to assess the possible interaction between biochar amendments and the use of biocides on soil health. The study was conducted at McPherson Prairie Preserve in the international BugNet experiment. The BugNet experiment consists in three blocks of 8 5x5m plots which have been receiving one of 8 biocide treatments for the last four years. In each subplot, two different feedstocks, spent brewer's grain and poultry litter, were converted to biochar and applied to two of the three quadrants. Bulk density, soil porosity, soil aggregate stability, soil respiration, root colonization, and infiltration rate will be assessed in all three quadrants. I will use statistical testing to analyze the effect of biochar and biocide (with their interaction) on soil physical properties using the experimental block as a random effect. We expect the biochar/no biocide treatments to increase infiltration rate, soil respiration, root colonization, soil stability, and porosity: and biochar/no biocide plots may decrease bulk and particle density. The biocide with biochar treatments may reduce some soil physical and biological properties. My work will provide insights into the benefits associated with the use of biochar for soil health and whether these benefits hold when using biocides. My study will therefore serve as a bridge between soil health and agriculture, which can lead to more restoration initiatives and funding to increase productivity in soils.

EFFECTS OF MAGNESIUM: PHOSPHORUS SUPPLY ON THE GROWTH OF PRIMARY PRODUCERS AND PRIMARY CONSUMERS IN FRESHWATER ECOSYSTEMS

Parna Ghosh, Justin Scott, and Puni Jeyasingh, Oklahoma State University - Stillwater

The availability and interactions of ~25 elements influence growth and production. Carbon (~50% of cellular dry mass), and nitrogen and phosphorus (building blocks of nucleic acids and proteins) are abundant intracellular elements. Phosphorus is present in ribosomal RNA (~50% cellular P), and in ATP, which are key molecules involved in protein synthesis and in energy transfer. Both in rRNA and ATP, magnesium (Mg) stabilizes the negative charge of phosphorus (P) and Mg:P ratio in these biomolecules is 1:2. Although Mg varies greatly in lakes from 100–8000 µg/L (nationally), and 3000–3700 µg/L across Oklahoma reservoirs, the role of Mg in eutrophication is poorly understood. We predicted that the largest impact of Mg on phosphorus use efficiency (PUE) in freshwater algae (Scenedesmus obliquus) and in their primary consumers (Daphnia), would align closest with the 1:2 Mg:P cellular requirement. We measured growth rate of Scenedesmus obliquus and Daphnia under a Mg:P supply concentration gradient (0.375–12 molar). For both producer and consumer, the highest growth rate was observed when Mg:P supply ratio was closer to 1:2 (1.5–4.5), indicating that biomass produced per unit of P assimilated is affected by the availability of Mg. Our results indicate that P loading in lakes is likely influenced by Mg availability and highlights the importance of understanding the impacts of Mg on PUE and productivity to effectively predict eutrophication of lakes with varying magnesium supplies.

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MECHANISMS OF HEME IRON ACQUISITION IN *MYCOBACTERIUM TUBERCULOSIS*

Trevor Hensley, Taylor Menard, Emilyn Rainbolt, and Avishek Mitra, Oklahoma State University - Stillwater

Outstanding Undergraduate Poster

Mycobacterium tuberculosis (*Mtb*), a human lung pathogen, is completely dependent on acquiring iron from the host to survive and cause infections. Like most pathogens *Mtb* can acquire iron from host heme, which stores >75% of the host iron. However, the importance of Hm iron acquisition to *Mtb* virulence is unknown because we have a very limited understanding of *Mtb* HIA mechanisms. In principle, there are three main steps to Hm uptake in diderm bacteria like *Mtb*. As majority of host Hm is complexed with proteins like hemoglobin, the first step in bacterial Hm uptake invariably starts with extracting Hm from the host hemoprotein. After Hm is extracted, it is then transported across the outer membrane (OM) by a channel protein and then across the cytoplasmic membrane (CM) by another channel protein. The Mitra lab has made crucial discoveries in identifying potential components of this Hm uptake process in *Mtb*: 1) Deletion of rv0125 or rv0338c reduces growth of *Mtb* in the presence of hemoglobin. We hypothesize that Rv0125 and Rv0338c are somehow required to extract Hm from hemoglobin so that Hm can be used as an iron source. 2) Deletion of ppe60 reduces growth of *Mtb* in the presence of Hm. PPE60 is a predicted outer membrane protein and we hypothesize that it is required for Hm uptake in *Mtb*. The goals of this study are to determine how Rv0125, Rv0338c and PPE60 contribute to Hm iron acquisition in *Mtb*. Specifically: 1) We will clone these genes into an expression plasmid and then produce and purify these proteins from *E. coli*. 2) We will perform binding experiments using isothermal titration calorimetry to determine if these proteins bind Hm. 3) We will use *Mtb* mutant strains to determine if absence of the genes affects Hm uptake into *Mtb* cells.

DANDELION SEED EXTRACT EXHIBITS BROAD-SPECTRUM, DOSE-DEPENDENT CYTOTOXICITY ACROSS MULTIPLE CANCER CELL LINES

Christina Hendrickson, Oklahoma City University

Natural products such as *Taraxacum officinale* (dandelion) have gained attention for their potential anticancer properties. This study evaluated the cytotoxic effects of Dandelion Seed Extract (DSE) on five cancer cell lines, HeLa (cervical), A2780 (ovarian), Panc2 (pancreatic), 4T1 (murine breast), and HT1376 (bladder). Cells were treated with increasing concentrations of DSE (0–2 mg/mL) for 24 h, and viability was assessed using PrestoBlue HS assay. DSE significantly reduced viability in all tested cell lines in a dose-dependent manner. Two-way ANOVA revealed significant main effects of both DSE concentration ($p = 7.8 \times 10^{-75}$) and cell line ($p = 2.2 \times 10^{-19}$), as well as a significant interaction between the two factors ($p = 6.1 \times 10^{-9}$). Among all cell lines, 4T1 exhibited the greatest sensitivity, showing >50% viability reduction at 0.2 mg/mL. These findings demonstrate that DSE exerts broad-spectrum, dose-dependent cytotoxic effects, with differential sensitivity across cancer types. This study suggests DSE contains potent bioactive compounds that may warrant further mechanism and in vivo investigation as potential anticancer agent.

INVESTIGATING *E. COLI* MECHANISMS FOR POTENTIAL THERAPIES IN BLADDER CANCER

Shane Holmes, Alejandro Lopez, and Janaki Iyer, Northeastern State University

Outstanding Undergraduate Paper in Microbiology

Bladder cancer remains a major health challenge, with an estimated 1 in 28 men and 1 in 89 women diagnosed during their lifetime. In 2025, the American Cancer Society projects nearly 85,000 new cases and over 17,000 deaths from bladder cancer in the United States. There are many different treatments methods, including surgery, immunotherapy, radiotherapy, and chemotherapy; however, there is a rapid rise in tumors developing resistance. This highlights the need for alternative therapeutic strategies. We previously observed that bladder cancer cells exposed to uropathogenic *Escherichia coli* CFT073 (*E. coli* CFT) are severely damaged. To gain more insight on mechanistic aspects, we have focused on studying interactions between the bacteria and host cells. We transformed *E. coli* CFT073 with a plasmid encoding GFP that enabled fluorescence-based tracking of the bacteria. Since many uropathogenic *E. coli* are invasive, we hypothesize that this strain (*E. coli* CFT-GFP) will robustly interact with 5637 bladder cancer cells resulting in stress responses similar to those caused by the wild type. Flow cytometry and fluorescence microscopy showed bacterial cells interact with bladder cells and induce stress in a bacterial cell density dependent manner. These results support the idea that bacterial cell interactions cause cell stress in bladder cancer cells. Future studies will investigate whether disruption of interactions between 5637 bladder cancer cells and *E. coli* CFT can reduce the stress on bladder cancer cells. These findings will aid us in our long-term goal of identifying the factor that the bacteria synthesize to induce cell damage in bladder cells.

INVESTIGATING ACOUSTIC PROPERTIES OF OOBLECK

Chance Krueger, East Central University

Outstanding Undergraduate Paper in Physical Sciences

The non-Newtonian behavior of a cornstarch and water suspension (Oobleck) presents a unique challenge for acoustic characterization, as its viscosity and modulus change with applied shear stress. This study investigates the acoustic properties of Oobleck, specifically the speed of sound and attenuation coefficient, which are crucial for applications in fields such as sonification and biomechanics. Studies will be analyzed by exporting A-scan data to a computer and processed using Python software. Oobleck was prepared to a standard concentration and contained within a small container with a 38mm width. Acoustic measurements were performed using a 4 MHz transducer in a pulse-echo setup. The data were collected via the A-scan technique, which provides a single-dimensional view of the acoustic signal amplitude over time. The speed of sound was calculated from the known sample thickness and the measured time-of-flight between echoes, while the attenuation coefficient (α) was derived from the change in echo amplitude across the sample path. All measurements were performed under static, low-shear conditions. After collecting all data the information was analyzed using Python to complete tasks such as calculating attenuation coefficient, speed of sound, and running a linear regression model to find correlations between concentration and attenuation coefficients.Early analysis of the data indicates that the Oobleck exhibits a heavy increase in the attenuation coefficient that shows heavy correlation to concentration. The change in velocity of sound is minimal however still noticeable.

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LABORATORY INVESTIGATION OF ENVIRONMENTAL EFFECTS ON COSMIC RAY CASCADES

Elena Gregg, Pavel Navitski, Wesley Klehm, Gabriel Pendell, Kolby Mostrom, Prem Thannickal, and John McLaughlin, Oral Roberts University

Outstanding Undergraduate Paper in Engineering Sciences

The Advanced Physics course at Oral Roberts University integrates authentic research experiences into undergraduate instruction to strengthen student understanding of experimental physics and scientific inquiry. A central component of this course is a student-led investigation of cosmic ray cascades, focusing on the detection and analysis of muons—massive elementary particles analogous to electrons, produced by high-energy interactions between cosmic rays and atmospheric molecules. This study represents the most recent phase of an ongoing research series conducted within the university laboratory. Earlier phases optimized detector configurations by calibrating steel plate thickness and mapping the angular distribution of muons under varied geometrical arrangements. Building on this foundation, the current phase investigates how environmental factors influence cascade formation and muon detection efficiency. Students employed an array of eleven steel plates inclined at 70° toward the northern horizon to record muon flux data across diverse atmospheric conditions. Measurements were systematically correlated with environmental parameters, including temperature, barometric pressure, and weather variability. Preliminary analysis indicates that elevated atmospheric temperatures are associated with reduced muon counts—consistent with higher meson decay altitudes—while lower pressure conditions appear to enhance muon transmission to ground level. The project provides a meaningful platform for undergraduate students to participate in hands-on particle physics research while contributing empirical data to the broader understanding of environmental modulation in cosmic ray cascades. This integration of experimental investigation with classroom instruction exemplifies the effectiveness of research-based learning in fostering scientific literacy, technical competence, and collaboration among emerging physicists.

A NOVEL APPROACH TO PRE-SERVICE TEACHER DEVELOPMENT: STEM CAMP INTERN

Robin Roberson, East Central University

East Central University is home to the I-DREAM grant (US Dept of Education) and the EdPASS-H2O grant (USEPA). I-DREAM's goals are to provide support to pre-service and in-service teachers to increase both the number entering the profession and the number retained in the profession. EdPASS-H2O's goals are similar, but for the water profession (increase those entering and retained), with the additional goal of increasing overall knowledge of water to produce better water consumers and advocates in the future. To support its goals, the EdPASS grant provides partial funding for the Human Water Cycle Academies which are offered through the OSRHE each summer. During summer 2025, I-DREAM provided a pre-service teacher intern for two of the Human Water Academies and followed this with a 3-week internship in which four pre-service teachers and one current Oklahoma middle school teacher developed and ran a 4-day STEM camp for 3rd-5th grade students at East Central University. This presentation will discuss what the interns gained from these experiences.

SURVEY OF THE ASSEMBLAGE OF DUNG BEETLES IN CIMARRON COUNTY, OKLAHOMA AND THE EFFICACY OF TWO DUNG TYPES AS BAIT

Byron Ross[1], Sue Fairbanks[2], Mary Liz Jameson[3], and George Wang[1], [1]East Central University; [2]Oklahoma State University; [3]Wichita State University

Outstanding Undergraduate Paper in Applied Ecology & Conservation

Dung beetles (Coleoptera: Scarabaeidae) provide important ecosystem services to agroecosystems, yet native dung beetle populations are declining faster than most other insects. Services provided by dung beetles include increased percolation and aeration of the soil, increased secondary seed dispersal, increased nutrient cycling, and pest control. Dung beetles can control pests such as the endoparasitic nematode *Haemonchus contortus*, an important parasite of pronghorn (*Antilocarpa americana*) transmitted by fecal material. Oklahoma's pronghorn population has also suffered declines in recent years, with a high fawn mortality rate. In this study, we sampled beetles in Cimarron County, Oklahoma to determine the species composition of the assemblage of dung beetles and their potential association with pronghorn in the Oklahoma panhandle area. We set up two transects of pitfall traps (n = 10 each) and baited them with either pronghorn dung or cattle dung. We recorded the arthropods collected in the traps for two days. We compared the abundance and species richness of beetles in our samples using negative binomial generalized linear models (NB-GLM). Pronghorn dung attracted significantly more beetle individuals ($z = 2.929$, $p = 0.0034$), but there was no difference in beetle species richness between the two types of bait ($z = 0.910$, $p = 0.363$). Our results suggest that dung beetles might be attracted more to the dung of native wildlife than domestic animals.

ABUNDANCE GRADIENT OF INVASIVE *BOTHRIOCHLOA ISCHAEMUM* IN A MIXED-GRASS PRAIRIE: VARYING IMPACTS ACROSS LEVELS OF ECOLOGICAL ORGANIZATION

Emani Rust, Caitlin Hodges, Xiangming Xiao, Heather McCarthy, and Lara Souza, University of Oklahoma

Outstanding Graduate Paper

Biological invasions are becoming more prevalent with the onset of climate change and anthropogenic development, threatening the ecological stability of terrestrial ecosystems by altering microhabitats and reducing native abundance and diversity. Grassland ecosystems are ubiquitous across space and time, providing several key ecological and economic services while also experiencing one of the greatest alterations to global changes, such as biological invasions. Here, we present results from a field experiment in a mixed-grass prairie that measured the impacts of a natural gradient of invasive *Bothriochloa ischaemum* on responses across levels of ecological organization. We found that increasing invader abundance was negatively associated with percent cover of a dominant native species, *Schizachyrium scoparium*. However, increasing invader abundance did not influence community structure (plot-level biomass and diversity) nor ecosystem function (soil respiration). These results suggest that *B. ischaemum* has competitive advantages over *S. scoparium* but is functionally redundant in mesic mixed-grass prairies. Furthermore, this study observed that the influence of biological invasions is not linear. Species-level responses may be the most sensitive to invasions, while community and ecosystem-level responses are more robust. By extension, species-level responses may be irrevocably altered by the time that responses in higher orders of ecological organization are detected.

HOOKLETS AND NEMATODES: FEATHER MICROSTRUCTURE AND EUCOLEUS DISPAR LESION SEVERITY IN SHARP-SHINNED HAWKS

Eden Ruth, Victoria Roper, Daniel Erikson, Briana Montgomery, Olivia Poplin, Jayna Vang, and Mark Peaden, Rogers State University

In recent years, banders in the Northeast have noted oral lesions in migrating Sharp-shinned Hawks, confirmed in New York (2016–2018) as Eucoleus dispar. Feather quality matters for flight, insulation, and waterproofing, yet links to parasite burden in raptors are largely unknown. We asked whether simple feather metrics track mouth-lesion severity so burden can be compared across seasons and sites when recaptures are rare. In fall 2023 at the Cedar Grove Ornithological Research Station (Glenbeulah, Wisconsin), banders scored oropharyngeal lesions (0–5) and collected two contour feathers per hawk (right pectoral tract and back). From a fixed imaging window (Leica; micrometer-calibrated) we counted barbules and hooklets (hamuli), recorded fault bars (narrow, paler bands from brief growth interruptions), and noted any longer thin zones in the vane. We then derived two metrics: a Feather Microstructure Index (FMI) (higher with more intact barbules/hamuli) and a Feather Quality Index (FQI) (feather mass per length). Body condition was estimated as mass relative to tarsus length within age–sex classes. The vane closes when hamuli on one barb's distal barbules catch the proximal barbules of the neighboring barb like Velcro hooks finding a loop. If barbules/hamuli are missing or misaligned, or if fault bars and thin zones occur, holes open in the vane. Air and water pass through those holes, increasing power needed to fly, lowering insulation and waterproofing, and increasing time spent preening—conditions linked to higher predation risk in songbirds. We related FMI and FQI to lesion score with linear mixed-effects models (age, sex, fat, crop, date as covariates), modeled fault-bar counts as counts, and tested body condition against FQI and lesion. Hypothesis: higher lesion scores are linked to lower FMI and FQI, greater faulting/thinning, and poorer condition. Small structures can scale to population-level effects; this work provides a simple, noninvasive signal of burden that banding stations.

ROLE OF THE TRANSCRIPTION FACTOR ZUR IN METAL HOMEOSTASIS IN *MYCOBACTERIUM TUBERCULOSIS*

Rashna Sharmeen Shama and Avishek Mitra, Oklahoma State University - Stillwater

Tuberculosis is caused by *Mycobacterium tuberculosis* (*Mtb*), a lung pathogen responsible for over 1.3 million deaths annually. To survive within the host, *Mtb* must tightly regulate metal homeostasis, particularly for essential metals such as iron and zinc. Under metal-replete conditions, metal acquisition genes are repressed, whereas in metal-restrictive environments, they are strongly induced. This balance is maintained by specialized transcriptional regulators that sense intracellular metal levels and modulate gene expression. Zur, a zinc-responsive transcription factor, is a key regulator of zinc homeostasis in *Mtb*. Recent evidence suggests that Zur also influences iron utilization, particularly heme (Hm). We found that deletion of zur impairs *Mtb*'s ability to use ferric iron across all ferric citrate concentrations. In the presence of Hm iron, the zur mutant shows a dose-dependent growth defect, with increasing heme concentrations exacerbating the phenotype, indicating that Zur fine-tunes iron acquisition under both ferric and heme iron conditions. Intracellular heme measurements revealed heme accumulation in the zur mutant, likely contributing to growth inhibition at higher heme concentrations. To define Zur's role in intracellular Hm levels, we will quantify mRNA levels of heme uptake and biosynthesis genes. Beyond metal regulation, Zur supports stress adaptation: zur deletion increases sensitivity to oxidative and membrane stress and disrupts biofilm formation. Biochemical characterization shows Zur functions as a homodimer, similar to other Fur-like regulators. UV–visible absorption spectroscopy confirms Zur-Hm interaction, suggesting Hm binding may modulate Zur's DNA-binding activity. Future work will examine how zinc homeostasis influences iron utilization in a Zur-dependent manner and assess Zur's role in virulence using macrophage infection models.

A PROBABLE NEW CARBONIFEROUS LAGERSTÄTTE IN NORTHEASTERN OKLAHOMA

Christen Shelton[1],[2], Kolby Dooling[3], Troy Rasbury[4], and Paul Northrup[4], [1]Rogers State University; [2]New Jersey State Museum; [3]Oklahoma State University; [4]Stony Brook University

A newly discovered fossil site in northeastern Oklahoma reveals exceptional preservation of Pennsylvanian-aged biota, comparable to the Buckhorn Asphalt Lagerstätte of the Arbuckle Mountains. The deposit, dated to approximately 310 million years ago, is embedded in hydrocarbon and uranium-rich sediments that may have helped facilitate the rare retention of original aragonite nacre layers in fossilized mollusks. These microstructural features, typically lost during diagenesis, can provide valuable insights into Paleozoic biomineralization and shell architecture. In addition to mineralized tissues, some phosphate nodules found at the site contain preserved soft tissue elements such as shark cartilage, skin, and brain endocasts, offering a rare anatomical perspective on Carboniferous life. Geochemical and sedimentological analyses are still on going. This discovery expands the known range of Late Carboniferous soft-tissue preservation and contributes significantly to our understanding of early molluscan evolution and taphonomic processes.

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REGIONAL CLIMATE CHANGE BASED ON *SALIX NIGRA* HERBARIUM COLLECTION

Michael Sherwood, Seth Brecheen, Denna Bussinger, Dakota Cao, Caden Elizalde, Amy Howard, Emree Hutchens, Grace Scott-Lang, and Elissa Yardy (East Central University)

Outstanding Undergraduate Paper in Biological Sciences (Botany)

Climate change has brought about and is predicted to bring about environmental changes such as a global increase in CO2. A central theme in plant biology is how plants are likely to respond to these predicted changes. One way to assess what changes to expect is by looking at the past. Herbaria record past plant attributes and thus can be used to predict the future. If we assume that CO2 is changing at the regional scale, then plants may be responding both plastically and adaptively. For example, it may be that as CO2 increases, the number of leaf stomata for C3 plants declines. In the current study, *Salix nigra*, housed at the East Central University Herbarium, were evaluated. Dates ranged from 1940 to 1989 with locations from the central Oklahoma region; additional regional samples were collected October 2025. We analyze leaf stomata on both upper and lower epidermis and their ratio as a function of collection year. If plants alter the number of stomata on leaf surfaces to reduce water loss while maintaining carbon assimilation, then we predict that year and stomatal densities will be inversely related. Future work will endeavor to tease apart confounding effects such as temperature and water availability, also predicted to change according to current climate models.

BIOTHERAPEUTIC *CHRISTENSENELLA* SPP. FOR GUT MICROBIOTA MODULATION

Shiny Talukder and Crystal Johnson, Oklahoma State University - Center for Health Sciences

The gut microbiome constitutes of a complex community of bacteria, archaea, and viruses that helps maintain the balance between health and disease. Recently, *Christensenella* species have gained attention as potential “next-generation probiotics” because they are linked to maintaining a lean body type and supporting healthy metabolism. There are four species of Christensenellaceae that have been isolated so far and among them *Christensenella minuta* has been shown to help regulate energy balance by producing short-chain fatty acids (SCFAs) and breaking down carbohydrates, suggesting it could play a role in preventing obesity. Studies have also showed that it has a syntrophic relationship with the archaeon *Methanobrevibacter smithii*, likely through hydrogen gas exchange. In addition, *C. minuta* produces bile salt hydrolase (BSH) and SCFAs like propionate, which are important for gut and metabolic health. Other species such as *Christensenella tenuis* and *Christensenella intestinihominis* have been associated with lower cholesterol (LDL) and apolipoprotein levels, as well as lower body mass index (BMI). These effects may be linked to its influence on appetite-regulating hormones such as GLP-1 and PYY. In this research, we cultured four *Christensenella* spp. (*C. minuta*, *C. tenuis*, *C. intestinihominis* and *C. hongkongensis*) using anaerobic techniques to observe their general growth patterns. Understanding how these bacteria grow and interact with other organism and with each other is an important step toward using them as live biotherapeutic candidates in future animal studies. Our findings will help guide future research on how *Christensenella* species can be applied to improve human metabolic health

EXPOSURE TO 'ALTERNATIVE' FLAME RETARDANTS ALTERS RAT AORTIC SMOOTH MUSCLE CELL FUNCTION IN VITRO AND DECREASES HEART RATE IN OVO

Alex Webb, Melville Vaughan, Austin Aduddell, Matthew Roberts, and Christopher G. Goodchild, University of Central Oklahoma

Outstanding Undergraduate Paper in Biomedical Sciences

Flame retardants are routinely incorporated into common household items, including furniture, car seats, and crib mattresses, to enhance fire safety. In 2004, concerns regarding the toxicity of traditional flame retardants, such as polybrominated diphenyl ethers (PBDEs), led to their replacement with 'alternative' flame retardants. However, the potential toxicity of these alternatives remains largely unknown. A particular concern is the risk of maternal transfer to the developing embryo, as these flame retardants have been detected in breast milk and placental fluid of pregnant women. In utero exposure to alternative flame retardants may lead to congenital defects, especially if exposure occurs during early embryonic development, which involves sensitive processes. This study focused on the potential effects of two alternative flame retardants, Triphenyl phosphate (TPP) and Tris 2-chloroethyl phosphate (TCEP), on arterial wall development. We employed in vitro tests, including wound scrape migration assays and microscopy, to assess cell migration and proliferation. To better understand adverse outcomes on cardiac function, we conducted in ovo experiments with chicken embryos to examine the effects of TPP and TCEP on embryonic heart rate and organ mass. Our findings suggest that TPP and TCEP may inhibit aortic smooth muscle cell function, which could potentially impact proper heart development and function. These results underscore the importance of further investigation into the safety of alternative flame retardants in household products.

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FUNGAL ESTROGENS: EXPLORING *PHALLUS IMPUDICUS* AS A NOVEL MODULATOR OF ESTROGEN RECEPTOR SIGNALING

Anna Wilson, Oral Roberts University

Outstanding Overall Undergraduate Paper

Outstanding Undergraduate Paper in Biochemistry & Molecular Biology

Estrogen receptors (ERs) play a fundamental role in women's health, regulating reproductive function, bone density, cardiovascular health, and neurological processes. While estradiol is the canonical ligand, structurally diverse natural compounds are increasingly recognized for their ability to mimic estrogenic activity. In this study, we investigated a novel mycoestrogen derived from the mushroom *Phallus impudicus* (colloquially known as the common stinkhorn) for its ability to activate ER signaling in T-47D breast cancer cells. To assess estrogenic potential, we compared the effects of the mycoestrogen to estradiol using cell viability assays and quantitative PCR analysis of ER-responsive gene expression. Treatment with the mycoestrogen elicited an upregulation of ER target genes, demonstrating functional receptor activation. These findings highlight the ability of fungal metabolites to influence human hormone receptor pathways, expanding our understanding of natural estrogen mimetics. Importantly, this work also seeks to address a persistent gap in women's health research. By characterizing naturally derived alternatives to synthetic estradiol—which is widely prescribed for contraceptive use and conditions such as endometriosis, PCOS, menopausal symptoms, osteoporosis, and hormone replacement therapy—our study opens the possibility of developing safer, more diverse treatment options. Our results position *Phallus impudicus*–derived compounds as promising new candidates for estrogen receptor modulation and as a step toward more inclusive research in women's health.

HOST-FEEDING BEHAVIOR OF MOSQUITOES IN CENTRAL OKLAHOMA

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There is limited knowledge about the feeding habits of mosquito vectors of arboviruses in central Oklahoma. This study aimed to identify blood meal sources of mosquitoes collected in the Oklahoma City area to better understand potential transmission dynamics among vertebrate hosts. Blood meals from 152 mosquitoes across eight species and four genera were analyzed using PCR assays targeting the 12s rRNA gene. Amplificons 215-bp long successfully amplified from 73 individuals from which 65 were Sanger sequenced with raw reads visualized and trimmed in Geneious and taxonomically identified using the Basic Local Alignment Search Tool (BLAST). The results showed that Aedes' species fed primarily on mammals, including *Odocoileus hemionus* (white tail deer) and occasionally feeding on passerine birds (i.e. *Quiscalus quiscula*, common grackle). Meanwhile, the *Psorophora* genus showed species-dependent preferences as *Ps. ferox* preferred mammals like *Sylvilagus aquaticus* (swamp rabbit) and *Ps. columbiae* passerine birds. In contrast, *Culex* species, particularly *Cx. tarsalis* fed on a broader range of hosts, including *Sciurus niger* (fox squirrels), *Cardinalis cardinalis* (northern cardinal) and the common grackle. These findings suggest that while some mosquito species are primarily ornithophilic, others are generalists in their feeding behavior particularly *Cx. tarsalis*. These feeding behaviors support our understanding that some species can be infected by arboviruses yet are not competent vectors, while others like *Cx. tarsalis* and *Cx. pipiens* complex act as bridge vectors between birds and mammals. These findings can be useful to improve our understanding of enzootic transmission cycles of arboviruses in Oklahoma.