Mar 8th, 10:00 AM

02. Biology

Southwestern Oklahoma State University

Mathematics and Science.Biology.01

NingWu, TeresaGolden, BradLudrick, TaylerHedgecock

Southeastern Oklahoma State University

The molecular mechanisms and the applications of reserpine induced rodent model

Reserpine, an indole alkaloid isolated from the Rauwolfia serpentina, has been around since the 1950s. This compound, used for hypertension treatment, had undesirable side effects in patients. The most notable side effect of inducing depression. Reserpine’s action is that it binds irreversibly to the VMAT2 receptor on biogenic amine storage vesicles. This, in turn, causes the storage vesicles to leak their contents into the neuronal cytosol. Cytosolic enzymes such as Monoamine Oxidases then, in turn, catabolize neurotransmitters, namely Serotonin (5-HT), Dopamine (DA), and Norepinephrine (NE). The depletion of these biogenic amines leads to an increase in depressive-like behavior in various rodents. In addition to inducing a depressive state, traits associated with pain were also observed in rodent models. Pain is an important characteristic that is comorbid in patients with major depressive disorder, often referred to as the pain-depression dyad. The extent of the induced-depressive state can be determined based on several proven tests such as the forced swimming test, open field test, and von Frey Hair test. Reserpine also induced visible and empirical changes in rodent behavior such as akinesia, ptosis, and hypothermia to name a few. Current research utilizing Reserpine ranging from drug discovery to pathogenesis of diseases such as fibromyalgia are also summarized. Reserpine shows efficacy as a suitable model of depression in rodents to further the study of this dis

Mathematics and Science.Biology.02

DariaReynolds, ThyHa, MonaEasterling

Tulsa Community College

A STUDY OF PUBLICLY ACCESSIBLE DATA REGARDING CHRONIC OBSTRUCTIVE PULMONARY DISEASE AMONG ADULTS IN TULSA, OKLAHOMA

Almost 15.7 million Americans report a Chronic Obstructive Pulmonary Disease (COPD) diagnosis, but more than half of US adults with low pulmonary function report they have not be diagnosed with COPD. 80% of COPD deaths are attributable to smoking. The use of publicly accessible data provides an opportunity to compare the number of self-reported smokers in our city to the number of individuals who report being diagnosed with COPD. The 500 Cities Project has incorporated multilevel regression and poststratification to link geocoded health surveys to produce local level health related estimates. The purpose of this project is to compare the percentage of adult smokers to the percentage of adults diagnosed with COPD using the 500 Cites Project data within Tulsa County.

Mathematics and Science.Biology.03

MarlyFixico-Hardison

Oklahoma State University

Temperature variance in Thailand: The relationship with free-ranging small subtropical mammals with ambient temperature

In the face of a rapidly changing climate, the ability to make informed decisions about how certain groups (plants vs. animals) or certain communities (tropical low elevation vs. tropical high elevation) might respond is a pressing problem for organismal biologists (Janzen 1967).

This study results from a Research Experience for Undergraduates (REU) that took place in northeastern Thailand in the summer of 2018. The goal of the study was to compare data from Thailand's subtropical regions, where there is a minimal variation of temperature, to regions with temperate conditions. By doing this, we hope to understand small mammal populations’ physiological response to fluctuating temperatures. Data was collected at the Maha Sarakham University forest in Koeng, Muang Mahasarakham, Maha Sarakham. Methods included identifying trapping locations and food preference, performing respirometry tests on small mammals captured, measuring site temperatures, and then releasing mammals at the captured site. With the use of iButtons and secondary temperature recordings, we were able to show a variance in the temperature of the small mammal's environment. However, due to a low sample count of small mammals we were are unable to determine the populations’ physiological response to fluctuating temperatures.

Mathematics and Science.Biology.04

CorbinWalters, IanFladie, AngelaClifton

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Is the Research you Value a Waste of Money?

Objective and Hypothesis:

Eighty-five percent of health research may be wasted, resulting in $170 billion annually in wasteful research spending worldwide. Given the increased use of randomized trials and their influence on medicine, one method to combat research waste is to conduct RCTs only when a systematic review (SR) suggests more data are needed or when no previous systematic reviews are identified. We hypothesize SR’s would be rarely cited as justification for conducting RCTs.

Methods:

We analysed RCTs published between 2016 and 2018 in New England Journal of Medicine, Lancet, and Journal of the American Medical Association. We performed duplicate and independent data extraction to ensure the accuracy and validity of our data. For each trial, we extracted whether SRs were cited as justification for conducting the clinical trial.

Results:

Our search retrieved 665 records, of which 628 were included. Overall, 706 SR’s were cited in these 628 RCTs; of which, 318 were referenced in the introduction, 82 in the methods, and 306 in the discussion. 49 SRs were cited verbatim as justification for conducting the trial.

Summary:

Very few clinical trials cite systematic reviews as the basis for undertaking the trial. We believe trialists should be required to present relevant systematic reviews to an ethics or peer review committee demonstrating an unmet need prior to initiating a trial. Eliminating research waste is both a scientific and ethical responsibility.

Mathematics and Science.Biology.05

MyshalMorris

Langston University

Identifying New EGFR Driver Mutations in Non-Small Cell Lung Cancer

Lung cancer is the leading cause of cancer deaths worldwide, with a 5-year survival rate of 18%. Non-Small Cell Lung Cancer (NSCLC) represents the major histological sub-type making up 85% of all lung cancers. One oncogenic driver of NSCLC is EGFR, which is mutated in 14% of patients. Currently, a subset of EGFR mutations remains functionally uncharacterized. In this study, we sought to functionally characterize all possible EGFR mutations. To systematically assess uncharacterized mutations in EGFR, we performed a saturation mutagenesis screen, where we identified both known EGFR hotspot mutations (EGFR L858R) and potential novel EGFR driver mutations. From our screening efforts we identified EGFR I759M as a potential novel driver of EGFR oncogenesis. To validate this finding, we expressed EGFR I759M in H3122, a NSCLC cell line, and performed a population doubling assay and a cell viability assay. We also evaluated EGFR I759M protein expression using western blot analysis. Together, our preliminary findings suggest that the EGFR I759M mutation is a likely driver of EGFR oncogenesis.

Mathematics and Science.Biology.06

TeresaMccarrell

Oklahoma State University

The Bacterial Cell Wall: Localizing enzymes required for peptidoglycan synthesis in the presence of β-lactam antibiotics

Bacteria are surrounded by a peptidoglycan (PG) cell wall that protects them from lysis due to turgor pressure. β-lactam antibiotics work by inactivating penicillin-binding proteins (PBPs) that synthesize the cell wall. E.coli has four PBPs. One of these is essential for elongation (PBP2) and another for division (PBP3), but the roles of PBP1a and PBP1b are unclear. Previously, the Weiss lab observed that a GFP-PBP1b fusion protein accumulated at division sites when PBP3 was inactivated with the β-lactam cephalexin. This finding suggests PBP1b might be a repair enzyme that localizes to sites where the cell wall is damaged. Here we artificially produced three foreign PBPs from Pseudomonas and Vibrio in E. coli. Two of the foreign PBPs localized to division sites when cells were treated with cephalexin. These foreign PBPs are only 21-38% identical in amino acid sequence to E. coli PBP1b. That makes the foreign PBPs too diverged to interact productively with any E. coli proteins. In contrast, the structure of PG is highly conserved among these bacteria. We conclude that septal localization of the PBPs is likely driven by recognition of some form of damaged or aberrant PG, with the intent to repair it.

Mathematics and Science.Biology.07

AustinJorski

Other

Global Health Uganda 2018: Where are we now?

Introduction – OSU-COM students and physicians have been traveling to Sister Rosemary’s in Gulu, Uganda to both learn about and assist in Ugandan healthcare since 2015. There have been many positive changes on Sister Rosemary’s compound with the addition of a birthing center and expansion of the health care clinic throughout the years. These additions have improved access to health care in Gulu and surrounding towns. We set out to analyze the current prevalence of disease and demographics in Gulu and Atiak in order to better understand and help the Ugandan people. Our research allows for tailoring of future health care education programs and distribution of research on future trips.

Methods – Data collection occurred through a standardized SOAP note created prior to departure to insure accurate data collection. All statistical analysis was done using excel.

Results – Our team saw roughly 450 patients and our data demonstrates that among the most prevalent disorders treated were gastroesophageal reflux disease, musculoskeletal pain, parasitosis, and upper respiratory infections.

Conclusion – This information allows us to be better prepared on future trips with proper medications and resources to best aid the Ugandan people. Future research topics to investigate would be to analyze the progression of disease throughout the years at Sister Rosemary’s and other locations affiliated with the global health program.

Mathematics and Science.Biology.08

EliviaLayton, SheylaRabei

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Nano-Graphene Oxide for Drug Delivery and Phototherapy

Laser immunotherapy (LIT) was developed as an alternative to traditional cancer treatment options because it targets both the primary tumors and metastases. Single-walled carbon nanotubes (SWNTs) have been used as a photosensitizing agent and drug delivery system; however, SWNTs may accumulate in the lungs and potentially in other organs. A search is underway for a nanoparticle that works both as a photosensitizer and a drug delivery vehicle and, more importantly, can also be expelled from the body safely. This study tests nano-graphene oxide (nGO) sheets used as a photosensitizing agent. The GO sheets were also synthesized with imiquimod, a known immunoadjuvant. Our results indicate that nano-graphene oxide, when functionalized with appropriate immunoadjuvant as well as other therapeutic agents, could be a useful tool in laser immunotherapy.

Mathematics and Science.Biology.09

SanaMesiya

University of Central Oklahoma

Subcellular Localization of Gold Nanorods in Cancerous Cells

Gold nanorods (GNRs) have the potential for cancer treatment as tumor-targeting photosensitizers due to their strong absorption of near-infrared light. The purpose of this project is to study the subcellular localization of GNRs in cancerous cells to optimize cancer treatment using irradiation at appropriate wavelength.

Subcellular localization of gold nanorods has been shown to have a significant impact on the viability and morphology of cancer cells as well as retention or exclusion of GNRs.

Our goal is to gain a comprehensive understanding of native and functionalized GNRs in order to develop safe and effective clinical applications for gold nanorods in laser treatment of cancers.

Mathematics and Science.Biology.10

SaraZukerman

University of Central Oklahoma

Laser-induced cellular effects of ICG and (R)-9bMS for cancer treatment

Metastases are the leading cause of cancer-related deaths. Common treatment methods of cancer- including chemotherapy, surgery, and radiation- often fail to effectively target and control metastases. Laser immunotherapy (LIT) used in tandem with a photosensitizer is a possible alternative that was developed with the idea of using the host's immune system to help attack both the primary tumors and metastases in order to develop long-term, cancer-resistant immunity. Studies using (R)-9bMS, a small molecule inhibitor, have shown that it significantly compromises cancer cell proliferation in triple-negative breast cancer cell lines. In this project, indocyanine green (ICG) and (R)-9bMS are combined to study photo effects using 4T1 breast cancer cells. The effects of (R)-9bMS and ICG on cell viability and migration were observed and analyzed. These results prove (R)-9bMS could be a useful addition to LIT when used on triple-negative breast cancer.

Mathematics and Science.Biology.11

TheresaStein, SkylerMills

Southwestern Oklahoma State University

The effects of stream order, season, and drainage on the abundance of two caddisfly families

Rivers are constantly flowing and vary in different locations. Therefore, one area of a river or stream may differ from another in abundance of organisms. However, streams remain connected, as changes upstream may affect areas downstream. We hypothesized that stream order, season, and drainage would affect the abundance of two caddisfly families (Leptoceridae and Hydroptilidae). Species within each of these families have been identified as species of conservation concern by the Oklahoma Department of Wildlife and Conservation. We collected adult caddisflies in the Kiamichi River, Little River, and Spring Creek drainages using manned and unmanned light traps. Samples were collected during both spring and summer months. For both families, we found no difference in abundance between seasons or among drainages. We found that the abundance of leptocerids was significantly higher in third order streams than first or second order streams. However, stream order did not have a significant effect on hydroptilid abundance. We conclude that stream order affects the abundance of Leptoceridae in eastern Oklahoma streams. This information can be used to optimize sampling effort to detect species of conservation concern in this family of caddisflies.

Mathematics and Science.Biology.12

HopeOgbeide, MaryTappert

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DEVELOPMENT OF A MICROFLUDIC IMMUNOLOGICAL ASSAY FOR THE DETECTION AND IDENTIFICATION OF STAPHYLOCCOUS AUREUS ENTEROTOXIN IN FOOD SAMPLES

This study describes the development and testing of a microfluidic immunological assay that combines lateral flow assay and microfluidic paper-based analytical device designs for the purpose of detecting and identifying enterotoxins from Staphylococcus aureus in contaminated foodstuffs. Initial design research was done using BSA and anti-BSA to mimic the actual target antibody/antigens. The final assay design will use culture supernatant from enterotoxin-producing S. aureus as antigen and commercially produced antibodies, with antigen-antibody binding detected by a fluorophore- or gold nanoparticle-labeled secondary antibody. We described the stepwise optimization of antigen binding, antibody flow, and complex detection in a microfluidic system.

Mathematics and Science.Biology.13

MakaylaMcGuire

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Extracts From Sea Sponges Inhibit Fibroblast Migration

Fibroblasts are the primary connective tissues present in the body and play a large role in wound healing. Human dermal fibroblasts, in vitro, are used to study cellular processes and stimulate a wound-like environment. Inhibition of fibroblast migration can be a preventative method of treatment among fibroproliferative diseases, such as Dupuytren's Contracture. Our goal was to find natural products that inhibit migration. The fibroblasts were plated with an elastomer plug and incubated at 37 ºC for two days. On the second day, the elastomer plug was removed to imitate a wound. The size of the wound was then measured. The treatment and media were combined and applied to the cells and incubated for one day. Pictures were retaken the following day. We then obtained measurements from each group. Lastly, the measurements of each treatment were compared to that of the control and data analysis ensued. Treatments were repeated multiple times to ensure the results are replicable. The results suggest that there are inhibitory properties exhibited by sea sponge extracts. Future research will consist of treatment, using the same sea sponge extracts, on Dupuytren's Contracture cells as a potentially non-invasive treatment option.

Mathematics and Science.Biology.14

DanielMarshall

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Predation Preference of Toxorhynchites rutilus septentrionalis on Two North American Encephalitic Arbovirus Vectors

Larvae of Toxorhynchites (Diptera: Culicidae) prey on mosquito larvae, reducing vector species populations. Adults feed on nectar and are incapable of transmitting human pathogens. Little research has focused on Toxorhynchites rutilus septentrionalis and its use as a biocontrol.

The goal of this project is to determine if T. r. septentrionalis exhibits a feeding preference between Aedes aegypti and Culex quinquefasciatus. Fourth instar T. r. septentrionalis will be presented with third instar prey larvae of both species and mortality will be observed. Manly’s alpha will be used to obtain probability of mortality for each species given the prey species population composition. Deployments of predatory larvae will take place at Arcadia Lake, Edmond, OK to determine if the laboratory model holds true in the field. Mosquito survey data from 2018 and 2019 will be used as a control to determine if mosquito species composition is altered by the introduction of T. r. septentrionalis.

Mathematics and Science.Biology.15

Khue TuDoan, MelvilleVaughan

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Glycated Chitosan Derivatives Inhibit Myofibroblast Form and Function In Vitro

Fibrotic diseases like Dupuytren's contracture (DC) involve excess scar tissue formation. The differentiation of fibroblasts into myofibroblasts plays a main role in DC as it generates contraction in areas without wound openings, leads to the deposition of scar tissue, and eventually flexes one or more fingers. Additionally DC has a high recurrence rate. Previously we showed glycated chitosan (GC), an immunoadjuvant polysaccharide, inhibited myofibroblast differentiation in a DC fibroblast culture; our goal was to expand those results to include other DC cell lines and determine whether single-walled carbon nanotube-conjugated GC (SWNT-GC) would be similarly effective. The GC-incorporated and vehicle control (water) stress-relaxed collagen matrices, in vitro 3D models, were used to show the compaction (anchored matrix height reduction) of DC fibroblasts using optical coherence tomography for 12 days. Fibroblasts were unable to compact in GC- and SWNT-GC-collagen matrices to the same extent as vehicle control lattices. Proliferative myofibroblasts were identified by the presence of alpha smooth muscle actin via immunofluorescent staining. Compared to control conditions there were fewer myofibroblasts in GC and SWNT-GC treatments but without a significant decrease in the number of nonproliferative fibroblasts. This suggests GC and SWNT-GC may be a possible treatment for the recurrent problem of fibrotic diseases by inhibiting fibroblast compaction and myofibroblast phenotypes.

Mathematics and Science.Biology.16

RussellSmalley IV

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Testing The Effects of Branched Poly(ethylenimine) and Ampicillin on Methicillin-resistant Staphylococcus aureus Biofilms

Methicillin-resistant Staphylococcus aureus, or MRSA, is a difficult to treat infection of both medical implants and wounds. This type of S. aureus is characterized by its resistance to beta-lactam antibiotics or those antibiotics that are derivatives of penicillin. The bacteria have an altered protein, PBP2a which is a mutated form of PBP that non-resistant strains use. MRSA strains can easily form biofilms compounding the effects of clinical treatment. They first create a physical barrier to prevent antibiotics from reaching the bacteria. The bacteria within the biofilms also have switched to a non-dividing nature or solitary lifestyle, most antibiotics only work effectively against actively dividing bacteria. Branched poly(ethylenimine), or BPEI, has shown to re-sensitize MRSA to the beta-lactam antibiotics. This occurs by targeting teichoic acid, a molecule PBP2a needs to properly function, leaving it vulnerable to beta-lactam targeting. Using a checkerboard assay, high molecular weight BPEI was tested for any synergistic antibiofilm effect when combined with ampicillin against MRSA biofilms. Results show that at a combination of 128 ug/ml of both BPEI and ampicillin results in a reduction in biomass. ANOVA testing indicates that BPEI and ampicillin individually have a significant effect on the biomass reduction of the biofilms but together are not significant. These results indicate further replicate trials are needed to further investigate the relationship between BPE

Mathematics and Science.Biology.17

JustinHarris, AlishaHoward, JefferyLiu

East Central University

Identifying Species Divergence in the Endemic Caecidotea Cave Populations

The Arbuckle karst system consists of caves, microfractures, and hydrogeologic barriers. Isopods in the genus Caecidotea inhabit the pools of water within the caves of the system. Young Caecidoteas travel through microfractures, and small populations move from one cave system to the next. Over the time these fractures close, causing the populations of Caecidotea to be isolated and potentially drift genetically. The sampled distinct populations have become morphologically distinct, but it is yet to be determined if they also have become genetically distinct species. DNA Barcoding using the Cytochrome Oxidase subunit 1 (COX1) gene will provide the percent of divergence in the samples obtained from different populations/locations. Successful DNA extraction is a pivotal part in this technique. A major obstacle addressed involves obtaining a high enough yield of DNA from the isopoda exoskeleton while keeping the extract clean from protein contamination. To address this, our lab has employed a variety of extraction procedures to optimize our DNA barcoding effort.

Mathematics and Science.Biology.18

ConstanceGreen

East Central University

Finding Novel Antibiotic Producing Bacteria

The demand for new antibiotics is extremely high due to an increase in antibiotic-resistant bacteria. This is causing common infections to become untreatable. The problem of antibiotic resistant bacteria is exacerbated by the thirty year gap in antibiotic discovery. Antibiotics are naturally occurring chemicals secreted from bacteria or fungi that kill other microbes. Thus, antibiotic producing bacteria are typically found in locations with high levels of competition with other microbes, such as the soil. Our goal is to use soil samples to find bacteria that produce previously unknown antibiotics in the hopes of postponing a post-antibiotic era.

Mathematics and Science.Biology.19

Colleen (Denver)La Force, ChristinaBourne

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Cloning and expression of Chlamydia trachomatis inclusion membrane proteins

Chlamydia trachomatis is an obligate intracellular human pathogen that resides inside host cells within a vacuole called an inclusion. To replicate & grow Chlamydia must usurp host cell proteins from within this vacuole. To do this, Chlamydia produce & secrete proteins, termed inclusion membrane proteins (Incs), that insert in the inclusion membrane with the N- and C- terminus facing the host cytosol. C. trachomatis is predicted to have 50 Incs, however few of these have known functions. Little knowledge about their function is gained via bioinformatics analysis as they lack similarity to any proteins outside of Chlamydia. This makes characterizing Incs or identifying possible functions difficult. The goal of this project is to clone & express the C-terminus of certain Incs which will be used to produce purified protein for future crystallography studies. This study focuses on the CT229-CT224 operon which is only found in human pathogens. Here, we present the cloning strategy of an Inc into the expression plasmid pET28a which will generate a C-terminus Inc fusion to a 6X His tag. To date CT226, CT227 & CT228 have been successfully cloned, verified by sequencing and transformed into BL21 for expression studies. Once the Inc proteins are produced they will be prepared for crystallography. By assessing the structures, insights may be gained as to possible functions based on similarity to other characterized proteins

Mathematics and Science.Biology.20

JessicaVallejo, NikkiMorgan, JessicaVallejo, DianaSpencer

Tulsa Community College

Optimization of the DNA Barcoding Protocol and the Evolutionary History of Botanic Garden Plants

DNA barcoding uses the sequences of a small section of DNA that is universally present and sufficiently varied to identify cryptic species, discover species, revise taxonomic schemes, and unravel food webs. The use of rbcLa and matK genes provides a method to test for species richness with genes that are sufficiently differentiated and universal. The aims of the study included: i) verification of identification of plants collected from the Tulsa Botanic Garden; ii) lab process analysis using two DNA extraction methods; iii) and evaluation of phylogenetic divergence using freely available software. DNA was extracted from the plant tissue using two methods, and the two genes were amplified using published primers and spectrophotometric data. Products were verified by fragment size on an agarose gel with a molecular mass ruler. Amplicons were purified using a spin column, diluted, and sent for sequencing. Freely available software tools were used for phylogenetic analysis. Sequencing showed a 29% success rate of amplicon production. Three out of twelve samples were positive for both matK and rbcLa identification, one sample was positive for only rbcLa identification. Twenty-five percent of our positive specimens had a 260/230 ratio less than 0.40. Fifty percent of our successful samples used less than the recommended 0.25ug of DNA for each 25ul reaction. There was no clear divergence between Angiosperm and non-flowering plants.

Mathematics and Science.Biology.21

LilianChooback, AlanNguyen

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Searching for Dihydrodipicolinate Synthase Inhibitors as a Possible Antibiotic

Dihydrodipicolinate Synthase (DHDPS) is the enzyme that catalyzes the first step in the lysine biosynthetic pathway. Lysine is an essential amino acid in humans and should be obtained through diet. Enzyme catalysis is initiated through binding of the first substrate, pyruvate, to the active site of DHDPS. The binding of the second substrate, ASA, is believed to form 2, 3-dihydrodipicolinate. Finding a tight-binding inhibitor for DHDPS in the lysine biosynthetic pathway will generate a compound which is a candidate for antibacterial drug design.

Kinetic studies of DHDPS and the inhibitor of the enzyme 2-bromopropionic acid showed that 2-bromopropionic acid is the competitive inhibitor of the enzyme versus pyruvate. Inhibition constant was determined to be 8.3 ± 0.8 mM. Crystals of DHDPS in complex with 2-bromoproprionic acid are formed at pH 7.5 in the presence of 8 mM 2-bromoproprionate, ~20% PEG 3350, 10 mM spermidine, 200 mM sodium tartrate, and 5.5 mg/mL DHDPS. Bacterial culture viability experiments indicate that 2-bromoproprionic acid inhibits the growth of Escherichia coli harboring DapA gene by 90%.

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Mathematics and Science.Biology.22

PrakashSah

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Chlamydia trachomatis Inclusion Membrane Protein CTL0478 Interaction with Flightless I Homolog

Chlamydia trachomatis causes a range of infections such as blinding trachoma and urogenital infections leading to serious complications. Inside the host cells, it lives in a parasitophorous vacuole called inclusion and secretes various effectors to manipulate host’s cellular processes. CTL0478 is an inclusion membrane protein (Inc) shown to co-purify with flightless I homolog (FLII) in a global Inc-human interactome study. FLII is known to regulate inflammation pathways. This study aims to characterize CTL0478-FLII interaction. In silico analysis of CTL0478 revealed a leucine zipper (LZ) within coiled coil in the C-terminal. Coiled coil is also found in host proteins interacting with FLII. C. muridarum contains a CTL0478 homolog with conserved leucine residues in LZ. FLII recruitment to C. trachomatis L2 inclusion was confirmed by Immunofluorescence. FLII recruitment was also seen in C. trachomatis serovar B and C. muridarum suggesting an overall conserved mechanism. HeLa cell line expressing CTL0478-GFP was generated for use in directed pull-down assays. Further, CTL0478 was cloned into chlamydial shuttle vector pBOMB-tet-mCherry which will be used to generate C. trachomatis L2 expressing flag tagged CTL0478 for co-localization and pull down assays.

Mathematics and Science.Biology.23

McKaylaMuse, KayleyPate

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Analysis of Proliferation and Migration in Phenylalanine, Retinoic Acid, and 4-diethylaminobenzaldehyde Treated Cells

Maternal phenylketonuria [MPKU] is a syndrome of multiple congenital anomalies including cardiovascular malformations [CVMs], and brain and growth restriction when a mother with Phenylketonuria [PKU] does not control her dietary intake of Phenylalanine [Phe]. However, the mechanisms responsible for Phe-induced CVMs are poorly understood. Our lab has preliminary evidence that high levels of Phe could inhibit Retinoic Acid [RA] signaling, which typically promotes the expression of genes such as proliferation, migration, and differentiation. Proliferation and migration of the neural crest cells are important in formation of the outflow tract (OFT) and aortic arch arteries (AAA). We hypothesize that Phe inhibits migration and proliferation, which may contribute to the defects seen in MPKU. We also looked at the effects of exposure to RA and 4-diethylaminobenzaldehyde [DEAB], a known RA inhibitor. We conducted in-vitro proliferation and migration assays on several cell types to determine if proliferation and migration was affected by Phe, RA, and DEAB exposure. Images were analyzed with ImageJ and GraphPad Prism. Present research suggests that Phe exposure causes a significant decrease in proliferation of cells. It is also shown that RA increases or does not affect proliferation, and that DEAB decreases cell proliferation. In this way, Phe is similar to DEAB, which suggests that it also acts as an RA inhibitor. This could contribute to the CVMs observed in MPKU. The results of mi

Mathematics and Science.Biology.25

JonathanDerouen

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Protein Kinase A Manipulation by Chlamydia trachomatis During Infection

The most commonly reported bacterial sexually transmitted infection in the United States is Chlamydia trachomatis which can lead to pelvic inflammatory disease, tubal infertility and even increased risk of cervical cancer. C. trachomatis is an obligate intracellular pathogen that lives in a parasitophorous vacuole. After infection, manipulation of different host proteins, including host kinases, aid in intracellular development and survival of C. trachomatis. However, not much is known about the mechanisms utilized by Chlamydia to manipulate host cellular kinases such as Protein Kinase A (PKA). PKA plays a key role in regulation of several cellular processes and is known to be manipulated by another obligate intracellular pathogen, Coxiella burnetii, which has a similar developmental cycle. We hypothesize that C. trachomatis manipulates PKA for intracellular development inside the host. Western blot analysis of lysates of C. trachomatis infected HeLa cells for PKA substrates showed increased phosphorylation during infection. Specific substrates of PKA also showed increased phosphorylation while the total PKA levels were similar across different time points of infection. These findings suggest that PKA is activated during C. trachomatis infection and may be integral to the infection process.

Mathematics and Science.Biology.26

DeepaliLuthra

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Determining the Role of Ca2+ and Ca2+- binding Protein EfhP in Adherence of Pseudomonas aeruginosa to Lung Epithelial Cells.

Pseudomonas aeruginosa is an opportunistic human pathogen, responsible for severe acute and chronic infections. It is one of the primary organisms that form biofilms on airway mucosal epithelium in the lungs of patients with cystic fibrosis (CF). Ca2+ accumulates in pulmonary fluids of CF patients and regulates hyperinflammatory host response to bacterial infections. Studies show that Ca2+ binds directly to the Ca2+-binding protein EfhP of P. aeruginosa and elevated Ca2+ leads to increased virulence in P. aeruginosa, but little is known about how Ca2+ regulates P. aeruginosa virulence during infection of human cell lines. The goal of this study is to determine how Ca2+ affects initial adherence of P. aeruginosa and the role of Ca2+-binding protein, EfhP in this host-pathogen interaction. The adherence of P. aeruginosa was determined with the wild-type strain PAO1, PAO1043 (efhp deletion mutant) and PAO1043.pMF (complemented strain expressing EfhP) utilizing human lung epithelial cell lines (A549) in low and high Ca2+ conditions using RPMI. It was estimated that RPMI contains approximately 0.5-0.67 mM Ca2+, which is spiked to 5mM to obtain the high Ca2+ condition for the assays. Adherence studies show that there is no significant difference in percentage adherence of all the three strains when compared amongst low and high Ca2+ conditions. Thus, EfhP doesn’t seem to play a role in adherence of PAO1 with A549 cells.

Mathematics and Science.Biology.27

DhakshyaneTamil Arasu

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Attachment of fibronectin with titanium by tresyl chloride activation method: chemical and cell analysis

Introduction: Basic terminal hydroxyl groups of a pure titanium surface react with tresyl chloride, which allows for further coupling with fibronectin.[1] Previous in vivo studies using a rabbit femur model found that immobilizing fibronectin onto cylindrical pure titanium implants enhanced bone regeneration around implants.[2] However, pure titanium has limited applications in the biomedical industry due to its inferior mechanical and biological properties, compared to biomedical grade titanium alloys, such as Ti-6Al-4V (the most commonly used titanium alloy in medical devices [3]). To date, no study has evaluated the attachment of fibronectin on Ti-6Al-4V (referred simply as Ti) by the tresyl chloride activation method. Thus, we examined whether human plasma FN can be attached to Ti-6Al-4V via the tresyl chloride activation method and evaluate the effect of the attachment on osteoblast cell adhesion and proliferation.

RandiReyes, JimenaAracena

Southwestern Oklahoma State University

Foraging Behavior of Fruit Flies (Drosophila melanogaster) on Sugar Patches in 3-D

Fruit flies (Drosophila melanogaster) are an excellent model organism to study the neural basis of behavior. An important function of the central nervous system is to process conflicting information and produce a response that increases the probability of survival of the animal. This decision making process can be studied on fruit flies feeding on patches of sugar in the laboratory. We present here preliminary results and a proposal to study the effect of gravity and orientation on foraging choices of flies in a three-dimensional setting. The ability of fruit flies to walk on vertical and inverted surfaces allows them to forage for food on inverted patches and on vertically placed patches at various angles of inclination. Our preliminary tests show that the flies feed at the same rate when foraging on two food patches facing up (67% feeding) as on two patches facing down (70%). When one patch faces up and the other faces down, only 44% of the flies feed. However, in all cases tested, the flies prefer the higher concentration of sugar, regardless of patch orientation. This suggests that patch orientation affects the locomotion aspect of foraging but not the feeding decision once the patch is located. To further test this hypothesis, we plan to use food patches that are spherically shaped, patches oriented vertically, and patches on a sloped diagonal plane.

Mathematics and Science.Biology.29

CaylieHolybee

Cameron University

EVOLUTIONARY RELATIONSHIPS AMONG SUBSPECIES OF THE EASTERN MOLE (SCALOPUS AQUATICUS) IN THE CENTRAL UNITED STATES

Scalopus aquaticus, commonly known as the eastern mole, is native to the eastern U.S. with populations extending into southern Canada and northern Mexico. Yates and Schmidly (1977) used morphometrics to study individuals from the central U.S., and Hall (1981) reported that 16 subspecies were recognized at the time. Here, we used cytochrome b sequence data to evaluate the genetic differences of 7 S. aquaticus subspecies to examine if geographical barriers within the central U.S. affect the gene flow of this species. We sequenced 465 base pairs of the cytochrome b gene from 36 museum specimens collected throughout the central U.S. Both neighbor joining and maximum likelihood methods, following a Tamura3 + G model of evolution and 1,000 bootstrap replicates, suggest there is genetic support for only 2 of these 7 S. aquaticus subspecies. Two specimens from Louisiana form a separate group from all other specimens in the central U.S. The validity of the subspecies in Louisiana, S. aquaticus howelli, was also supported with an average genetic distance of 5.8% when compared to any other specimen. Pairwise genetic distances between all other moles averaged 2.3%. Our results, using cytochrome b DNA sequences, are similar to those of a previous unpublished student thesis using D loop sequences. Together these studies suggest high levels of gene flow among moles throughout the central U.S. and call into question the taxonomic status of many S. aquaticus subspecies.

Mathematics and Science.Biology.30

GreysonWeedon, ZachJones

Southwestern Oklahoma State University

Botteri’s Sparrow Density Changes With Spreading Non-native Habitat in Southeastern Arizona

The Botteri’s Sparrow (Aimophila botterii) is a bird of tall grasslands that temporarily disappeared from Arizona following heavy livestock grazing in the 1890s. Its return was noted first in sacaton (Sporobolus wrightii), an uncommon native floodplain tallgrass often >2 m in height, and subsequently in stands of exotic lovegrasses (Eragrostis spp.) spreading into adjacent uplands that otherwise supported shorter native grasslands. From 1999-2001, 18, 10-ha plots (six each of sacaton, exotic, and native upland habitats) were sampled for Botteri’s Sparrow density and vegetative characteristics and demonstrated that exotic grasslands were providing suitable breeding habitat, not functioning as an ecological trap. At that time, territorial density was positively associated with grass height and cover, being greatest in sacaton, intermediate in exotic, and lowest in native upland grasslands (8.5, 5.5, 4.3 territories/plot, respectively). The goal of the proposed work is to measure both the vegetation characteristics and territorial densities on the same plots that were sampled 20 years ago with the expectation that the spread of exotic lovegrasses has continued, now covers a larger proportion of the shorter native grassland plots, and concomitantly supports relatively higher densities of Botteri’s Sparrows on those plots than before.

Mathematics and Science.Biology.31

AliciahWalker

University of Central Oklahoma

Examination of genetic structure in Mediterranean Geckos (Hemidactylus turcicus) at the University of Oklahoma South Oval

Mediterranean Geckos are an exotic species that are excellent for studying evolutionary mechanisms. They spread around the world by using the ability to adapt to human architecture. Once geckos are established, the population expands slowly. Our goal is to better understand processes limiting gene flow between groups that are relatively close to each other but that have diverged across short time spans, with collecting at least 20 geckos per building. We started sampling the invasion of geckos at the University of Oklahoma (OU), which was first colonized in the 1940s or 1950s by escapees from one of two buildings: Richard Hall or a laboratory near the current Clock Tower. We have surveyed fifteen buildings in the South Oval of the campus and found two buildings that do not have geckos. So far, we have collected over 124 samples from South Oval. We expect to see low genetic diversity and multiple genetic clusters compared to findings from other locations. The data collected from OU will be compared to UCO and the Oklahoma City Zoo, three independent colonizations with similar environmental conditions.

Mathematics and Science.Biology.32

EmilyBedea

Southwestern Oklahoma State University

In-silico analysis and homology modeling of β-carbonic anhydrase from Streptococcus sanguinis, an opportunistic pathogen involved in subacute infective endocarditis

Streptococcus sanguinis is one of the leading causes of infective endocarditis (IE) in a susceptible population. Although several virulence factors involved in IE have been identified, the exact mechanism by which S. sanguinis colonizes endocardium remains unclear. In addition to some well-characterized virulence factors, S. sanguinis also contains virulence-associated proteins that are not well characterized. One such protein that is associated with virulence is carbonic anhydrase (CA) that catalyzes the reversible hydration of CO2 to bicarbonate. The goal of this study is to identify and characterize carbonic anhydrase from S. sanguinis.

We have identified a β-CA from S. sanguinis (SsaCanB) using BLAST analysis that shows high homology to other well-studied β-carbonic anhydrases. SsCanB is an 18.2 kDa protein with no N-terminal signal peptide indicating its cytoplasmic localization. Sequence alignment of S. sanguinis with closely related homologs shows conserved domains typical of β-CA including residues important for metal coordination and protein-protein interactions. Homology modeling and subsequent structure analysis of SsCanB reveals that both proteins have α/β fold typical of β-CA’s. Analysis of the active site of SsaCanB shows conserved residues involved in zinc ion coordination similar to other well-studied β-CA’s. Furthermore, the catalytic dyad (Asp/Arg) required for the activation of water molecule coordinated with

Mathematics and Science.Biology.33

KaitlynHickey

University of Central Oklahoma

Using Mitochondrial DNA to Create a Wildlife Genetic Database

The “Using Mitochondrial DNA to Create a Wildlife Genetic Database” research project is interdisciplinary between forensic science and wildlife biology. Samples of various animal tissues were taken from the Oklahoma City Zoo in groups of ten based on importance to the Zoo. The samples are stored at the University of Central Oklahoma and individually put through the process of DNA extraction, purification of mitochondrial DNA, and PCR. The samples are then genetically sequenced and a genetic profile created. The goal of the project is to have enough samples from different exotic, endangered, and protected animals to create a DNA database where samples of new genetic profiles or profiles already produced, whether species is known or not, can be submitted and compared to the known genetic profiles. Being able to identify species from a genetic profile would be very useful for criminal cases involving said animals. Having a database with known genetic profiles from many different species could give more certainty to these criminal cases and result in better outcomes.

Mathematics and Science.Biology.34

SamuelTing, MelvilleVaughan

University of Central Oklahoma

Cytoskeleton changes induced in Dupuytren’s contracture cells by phenformin

Dupuytren’s contracture is a disease caused by formation of connective tissue in the dermis that will affect the movement of fingers. Myofibroblasts participate in wound healing and excessive scarring in patients with Dupuytren’s contracture and other fibrotic diseases.According to prior research, Myofibroblasts are characterized by an abundance of alpha smooth muscle actin (αSMA) within stress fibers in the cytoplasm of the cell. We proposed a research to find out how the cytoskeleton in the Dupuytren’s contracture (DC) change when it’s introduced with Phenformin. Therefore, we predicted that when DC cells are exposed to Phenformin, DC cells stop the migration process but still undergoing proliferation. So, we wanted to find a visual evidence of what we predicted.This study is mainly used to examine the differentiation and proliferation that phenformin has on DC cells. Through scientific analysis of the data from OCT, image J and fluorescence microscopy, the group treated with phenformin demonstrated suppression of myofibroblast differentiation and had no changes in cell proliferation. Our result showed a slight reduce in lattices height using OCT and decrease in alpha smooth actin muscle via click-EdU staining assay.Therefore, Phenformin has the potential to treat Dupuytren’s contracture (DC) by inhibiting the differentiation and proliferation of myofibroblasts. Our future goal is to run more myofibroblast-appropriate functional bioassays

Mathematics and Science.Biology.35

JohnBarthell

University of Central Oklahoma

Foraging Patterns of Three Carpenter Bee Species at Chasteberry Bushes in an Aegean Island Ecosystem

We recorded foraging times of three species of carpenter bees at chasteberry bushes on the Northeast Aegean island of Lesvos (Greece). These records were made at 30-minute intervals over a 14-hour period (before sunrise and after sunset). In a sister study, we observed activity patterns of the same bee species in order to elucidate any corresponding circadian rhythms. The largest bodied of the three bee species was most frequently observed during the earlier and later periods of the day while the smallest bodied species was more common during the middle of the day. The third species (mid-sized) was crepuscular in its habits. Ecological and genetic factors may both contribute to these differences in foraging times and larger bodied species may have a physiological advantage during cooler periods of the day (given their reduced ability to radiate heat) while smaller bodied species may better forage during the hottest times of day. Subsequent studies of the thermotolerance of these species are consistent with this conclusion; the crepuscular species may have more limited ranges of time for foraging than the other two species. This study system has application to broader questions concerning foraging dynamics of pollinator species within plant communities across ecosystems.

Mathematics and Science.Biology.36

KyraGallagher, WeiChen

University of Central Oklahoma

An exploration of the potential role of the synthesis between low-density lipoproteins and reduced graphene oxide in laser immunotherapy cancer treatment

Laser immunotherapy (LIT) is a cancer treatment modality which utilizes a photosensitizer and an immunoadjuvant to spark an immune response after lasing the primary tumor, which then allows for the destruction of metastases around the body. It is possible that the materials on which LIT relies could be transported to cancerous cells via the use of low-density lipoproteins (LDL), which occur naturally in mammals. This delivery method makes use of the overexpression of LDL receptors (LDLR) by cancer lines. This increased uptake will be confirmed via western blot. Previously documented effects of reduced graphene oxide (rGO) suggest its useful nature in LIT, rendering it a prime candidate for integration into an LDL nanoparticle. This study will perform assays on a synthesis between these two materials, dubbed rGO-LDL, to assess its impact in cells and under laser conditions. Tests will include an investigation of rGO-LDL uptake in healthy and infected cells, toxicity, and migration inhibition, repeated both with and without laser treatment.

Mathematics and Science.Biology.37

CarinaGutierrez

University of Central Oklahoma

CONSTRUCTION OF A MICROBACTERIOPHAGE LYSOGEN

Bacteriophages are viruses that infect and replicate in a bacterial host cell. The Oklahoma soil due to its diversity is a good source for finding new bacteriophages. Due to the emergence of drug-resistant bacteria, there is an increasing need for isolating new phages that can be used for phage therapy. In my research, I have purified and sequenced three bacteriophages from Oklahoma soil. These bacteriophages were previously isolated by Virology students at the University of Central Oklahoma. The soil phages were isolated using Microbacterium foliorum as the host bacteria. I hypothesize that we will be able to find a lysogen for one of the three phages. A lysogen is a host bacterium cell that contains a stably integrated copy of a phage genome. This research began with the purification of each phage sample, followed by amplification to obtain purified phage lysates. Viral genomic DNA was extracted from each of the three samples. Phage genomes were characterized using restriction digest with HaeIII, NspI, and SacII. Phages Arroyo and Busephilis have been sequenced using Illumina sequencing technology. Phages Arroyo and Busephilis are newly discovered bacteriophages from Oklahoma soil with a genome length of 42129 and 52986 bp respectively. I have successfully created a lysogen for Phage Sasian. The purified lysogen can be used to test the ability of other phages to infect the new lysogen. The results from this study expand the knowledge of host immunity to phage infection.

Mathematics and Science.Biology.38

OswahCheema

University of Central Oklahoma

Quantifying Diffusion Coefficient of Flagella-driven Cellular Motility

Cilia and flagella play a very important role in maintaining the human body to function properly. Dysfunctioning of cilia impairs the functioning of many human systems, examples include heart, brain, and respiratory system. Though biology of cilia has been under research for a long time, biophysical properties of them are not yet clear. The structure of green algae Chlamydomonas flagella is very similar to human cilia. The viscosity of medium Chlamydomonas are cultured do affect their cellular diffusion and the movement of their flagella. To test it, light scattering based particle imaging techniques in combination with Matlab applications are used to measure their speed. Culture media of 1cp, 4cp, 10cp, 25cp, and 100cp are made and cells are allowed to cultivate in them. The movement of Chlamydomonas is recorded with the help of laser microscope and digital camera. The recorded videos are then analyzed, closely tracking the path of green algae. The results found are that Chlamydomonas reinhardtii move fast in 1cp, while are barely moving in 100cp medium, which is in accordance with our hypothesis.

Mathematics and Science.Biology.39

ZoeAndrews, MelvilleVaughan

University of Central Oklahoma

Ker-CT-Ras Migration in a 3D Cell Culture

Background: The normal architecture of skin is determined by the proliferation and stratification of keratinocytes and the maintenance of the basement membrane. Keratinocytes are the primary skin epidermal cells that are affected by squamous cell carcinoma and basal cell carcinoma. Ras activation is a major pathway that is likely to be involved in cellular changes that produce skin carcinoma. These proteins are essential to cancer progression because of their effect on proliferation and expression of collagen degrading enzymes.

Methods: To better understand the migratory nature of pre-cancerous keratinocytes out of a 3D skin equivalent we used a nested matrix model. The migratory nature of the cells was observed through time-lapse photography. Other methods included cell culture and collagen lattices.

Results: Preliminary data from our lab demonstrates a finger- like migration of Ker-CT-Ras cells out of the nested matrix, suggesting chemotaxis or grouped cell migration. Migration assays out of a nested matrix are currently ongoing.

Conclusion: We hope to gain a better understanding of the migration of precancerous keratinocytes, out of a 3D model. This will help us better understand epithelial organization when affected by oncogenic changes. Ultimately, this data will contribute to understanding the mechanisms of epithelial cells, their migration, and pathogenesis of metastases

Mathematics and Science.Biology.40

DelaneyWilliams, SarahCusack

Southwestern Oklahoma State University

Stroke Strikes the US: An Analysis on Stroke Statistics In The US

The purpose of this Health Statistics project was to describe trends in mortality rates due to stroke in the United States. We hypothesized that females would have a higher mortality rate than males in the US due to a stroke. We also hypothesized that there would be a positive correlation between smoking and mortality rates due to stroke. There were obvious trends in the data to develop conclusions from. We created graphs, ran an ANOVA test, a t-test, and computed correlation values using Microsoft Excel in order to analyze statistical differences in mortality rates relating to race, gender, and other variables. Through a correlation value, we found a strong positive correlation between smoking and AAMR, but no significant difference in AAMR was detected between genders.

Mathematics and Science.Biology.41

JosephWagner, MelvilleVaughan, GangXu

University of Central Oklahoma

Measuring the Material Properties of the Engineered Tissue

The objective of this study is to determine the mechanical properties of the fibroblast-populated collagen lattices as the dermal-equivalent engineered tissue. Fibroblasts reorganize the collagen matrix by applying the traction and tensile forces that are important for the homeostatic morphology and material properties of the extracellular matrix. During development, the collagen lattices undergo dramatic compaction and contraction processes that lead to changes in their elastic properties. The mechanical properties of the tissue in turn affect cell differentiation and functions. In this study, we designed and built a microsphere-based magnetic indentation system to measure the regional material properties of the engineered tissue during development or treatment. The indentation forces were controlled by varying the magnetic forces on the ferric microsphere under either permanent or electro magnets. The resultant tissue indentation was directly visualized by an optical coherence tomography imaging system. In a preliminary set of experiments on engineered tissue a micro-Newton indentation forces have been applied and resulting indentation has been measured. It was determined that changes in the elastic properties of the tissue during development are correlated to the increased compaction and contraction of the tissue by the fibroblasts. The technique and results will shed new light on the biomechanics and mechanobiology of the tissue in developmental or during wound healing.

Mathematics and Science.Biology.42

SarahVrla

University of Central Oklahoma

Genetic structure and the potential for hybridization in populations of Peromyscus spp. of plateau regions in western Oklahoma

The biological species concept defines separate species as those being unable to interbreed or produce viable, fertile offspring in sympatric areas. Morphological or genetic differences also have been used to recognize species in both sympatric and non-sympatric distributions. In many instances, hybridization between closely related species occurs in sympatric areas. This phenomenon is common in the genus Peromyscus. The white-footed deermouse (Peromyscus leucopus) and the North American deermouse (P. maniculatus) are sympatric across much of central and eastern North America. Both are considered habitat generalists, but do exhibit distinct preferences as P. leucopus predominately occurs in woody or brushy areas and P. maniculatus is found predominately in grassy areas. In the plateaus of Four Canyons Preserve in western Oklahoma, specimens could not be identified as either P. leucopus or P. maniculatus using morphological characteristics, and it has been hypothesized that these individuals represent hybrid samples. In order to investigate the genetic structure of this population and determine if hybridization between these species is occurring, I am utilizing microsatellite data and a species identification marker to compare to specimens from allopatric regions to samples in Four Canyons Preserve.

Mathematics and Science.Biology.43

ClaireSmith

University of Central Oklahoma

A qualitative survey of ultraviolet (UV) reflective morphology in mammals

Communication in the ultraviolet (UV) has an array of adaptive functions such as foraging, social signaling, sexual selection, nectar-location, territory marking, etc., and is known to occur in a wide variety of taxa including plants, insects, reptiles, birds, and mammals. Communication in the UV requires some form of signaling mechanism, in the form of UV reflective morphology (i.e. hair) as well as a visual system capable of interpreting wavelengths in the upper UV range (390nm). Reflection of ultraviolet light by morphological markings in the kangaroo rat, Dipodomys ordii, has been confirmed (McDonald et al., unpublished). This UV-reflective morphology has been validated quantitatively through UV-VIS photospectrometery and subsequently corroborated qualitatively with UV-photography.This method incorporates the UV-reflective standard Fluorion to visually discriminate between UV-reflectivity and absorption while also allowing us to estimate the degree of reflectivity observed. Using this approach, we examined UV-reflective morphology in a variety of mammalian species. Here we present our preliminary findings of species that exhibit some degree of UV reflective morphology. These results qualitatively suggest UV-reflection among these species, though further study is needed to determine if any of these morphologies have any adaptive significance or are the product of neutral selection.

Mathematics and Science.Biology.44

GaryThomas

University of Central Oklahoma

Population Structure and Genetic Diversity of Mediterranean Geckos (Hemidactylus turcicus) at the University of Oklahoma (OU) North Oval

The Mediterranean gecko is from the Middle East and has become an exotic species in the United States, living on building walls. Once these geckos are established in an area, they venture out via slow dispersal due to their small territorial range. The invasion of geckos at OU were established in the 1940-50’s after escaping from research labs at one or both of two sites: Richards Hall and the Clock Tower. We are studying OU to compare it to other locations in central Oklahoma, close to the northern end of the species’ U.S. range. On OU’s North Oval, we sampled 16 buildings with 9–20 samples per building so far. Our goal is to have 20 per building. We collected 210 samples from North Oval and genotyped 16 micro-satellites per individual to evaluate genetic variation and differentiation. We expected multiple sub-populations of geckos within the North Oval. We found two distinct clusters. Future data will allow further exploration of how exotic and invasive species adapt to an urban life in colder climates.

Mathematics and Science.Biology.45

CarlieJennings

University of Central Oklahoma

A qualitative survey of ultraviolet (UV) reflective morphology in bats

Communication in the ultraviolet (UV) has an array of adaptive functions such as foraging, social signaling, sexual selection, nectar-location, territory marking, etc., and is known to occur in a wide variety of taxa including plants, insects, reptiles, birds, and mammals. Communication in the UV requires some form of signaling mechanism, in the form of UV reflective morphology (i.e. hair) as well as a visual system capable of interpreting wavelengths in the upper UV range (390nm). Reflection of ultraviolet light by morphological markings in the kangaroo rat, Dipodomys ordii, has been confirmed (McDonald et al., unpublished). This UV-reflective morphology has been validated quantitatively through UV-VIS photospectrometery and subsequently corroborated qualitatively with UV-photography.This method incorporates the UV-reflective standard Fluorion to visually discriminate between UV-reflectivity and absorption while also allowing us to estimate the degree of reflectivity observed. Using this approach, we examined UV-reflective morphology in a variety of bat species (Order Chiroptera). Here we present our preliminary findings of species that exhibit some degree of UV reflective morphology.

Mathematics and Science.Biology.46

DianeDixon, AlexisBurgess

Southeastern Oklahoma State University

The Effects of Intestinal Bacteria on the Growth of Cancer Cells

There is increasing evidence that the microbiome within individuals can influence on the overall health of those individuals. Many bacteria are considered probiotic in which their presence in the intestine benefits the health of the individual. The bacteria that belong to the genus Bifidobacterium are Gram-positive anaerobic bacteria which are normal intestinal inhabitants that have demonstrated to have probiotic properties. Bacterial strains that were isolated from the feces of residents of a top five longevity village in China were examined. The number of residents in the village who live to be 100 years old is five time the international average and the incidence of cancer is ten times lower than in the United States. One bacterial strain was identified as Bifidobacterium longum while two strains were identified as a members of the Lactobacillus genus. In order to investigate the possible contributing role of these bacteria to the longevity and low cancer rates of this population, supernatants from these bacteria were added to a colon cancer line, HCT-8. The growth of the cancer cells were determined by a MTT assay. The results demonstrate supernatants from these bacterial strains inhibit the growth and/or kill the HCT-8 cells. Boiling the bacterial supernatants before adding it to the HCT-8 did not affect the detrimental effect on the HCT-8 cells indicating that the inhibitory substance is heat stable.

Mathematics and Science.Biology.47

MatthewParks, SamuelLe

University of Central Oklahoma

Design and testing of a simple and efficient 2-step method for 18s metabarcode amplification and Illumina library preparation

Metabarcoding methods allow rapid characterization of complex microbial communities through the sequencing of shared, taxonomically diagnostic genetic loci. These methods are particularly useful for identification of diverse microbiota lacking clear morphological traits. Our project seeks to apply DNA metabarcoding to characterize microbial communities present on the shells of freshwater turtle species in Oklahoma. Results will ultimately provide insight into aquatic microbial ecology and response to habitat perturbation. Our preliminary objective is to design a 2-step PCR amplification strategy to simultaneously amplify the V4 and V8-9 hypervariable regions of the eukaryotic 18s ribosomal DNA locus and prepare amplification products for sequencing on the Illumina MiSeq platform. We will use two sets of "fusion" primers: 1) a first set with complementarity to conserved flanking regions of target loci and a tail incorporating short, sample-specific index sequences and complementarity to Illumina sequencing primers; 2) a second set allowing amplification from the first PCR reaction and containing a tail allowing binding to the Illumina flowcell. I will describe my progress toward designing and testing of these fusion primers on several microbial communities isolated from aquatic substrates, based on amplification strength and consistency.

Mathematics and Science.Biology.48

MatthewParks, SamuelLe

University of Central Oklahoma

Design and testing of a simple and efficient 2-step method for 16s metabarcode amplification and Illumina library preparation

Metabarcoding is a DNA sequencing strategy that allows for high throughput sequencing and DNA-based identification of complex microbial communities. This method is particularly useful for identifying microorganisms based on taxonomically informative DNA sequences rather than morphological or metabolic characteristics. Our project seeks to apply DNA metabarcoding techniques to characterize microbial diversity present on the shells of freshwater turtle species in Oklahoma. Results will ultimately provide insight into aquatic microbial ecology and response to habitat perturbation. Our preliminary efforts involve designing a 2-step PCR protocol to simultaneously amplify the V3-V4 hypervariable regions of the prokaryotic 16s ribosomal RNA locus and incorporate sequence motifs necessary for sequencing on the Illumina MiSeq platform. Our technique relies on two sets of "fusion" primers for PCR amplification: 1) a first set with complementarity to conserved regions flanking the V3-V4 regions and a tail incorporating short, sample-specific index sequences and complementarity to Illumina sequencing primers; 2) a second set allowing amplification from the first PCR reaction and containing a tail allowing binding to the Illumina flowcell. I will present initial results of primer design and testing on several microbial communities isolated from aquatic substrates based on amplification strength and consistency.

Mathematics and Science.Biology.49

ChaneyFreese, HannahBudde ReginaMcGrane

Southwestern Oklahoma State University

Investigating the Impacts of Mutations on Promoter Efficiency

Promoters are specific sequences of nucleotides that serve as initial determinants for the intensity of gene expression. Promoter variation has been shown to contribute to development of genetic disorders and cancer. Our objective was to investigate the impact of promoter variations on bacterial gene expression. We hypothesized that nucleotide changes would impact expression and regulation of reporter genes. To test this hypothesis, we used recombinant DNA technology to combine wild-type and mutant versions of the pLacI promoter with a characterization construct encoding green fluorescence protein (GFP) followed by the LacI repressor under the control of an arabinose inducible promoter in a plasmid. The resulting constructs were transformed into Escherichia coli. The wild-type promoter acted as our control while two mutant promoters each contained two or three nucleotide changes. To determine the efficiency of each promoter, we quantified GFP expression by measuring fluorescence. Both mutants exhibited significantly reduced fluorescence, demonstrating small nucleotide changes significantly impact gene expression. To determine if mutations impact repression, different concentrations of arabinose were added to growing cultures. Reduced fluorescence was observed in all samples, suggesting the mutations did not impact repression. Collectively, our data demonstrates that nucleotide changes in promoters can drastically impact gene regulation.

Mathematics and Science.Biology.50

Su XhianLim, HannahKnox, KaylieSmith, ReginaMcGrane

Southwestern Oklahoma State University

Developing Inexpensive Methods for Detection of Toxic Metals in Oklahoma Water

Cadmium is a naturally occurring metal found in the Earth’s crust; however, high concentrations may be toxic. This toxicity is especially concerning to Oklahomans due to excessive cadmium pollution in the Tri-State Area Lead-Zinc mining region. In order to develop inexpensive methodologies for the detection of cadmium, we purposed to generate a cadmium-sensitive bacteria using synthetic biology. We hypothesized that plasmids encoding a cadmium sensitive promoter could be used as biosensors for cadmium pollution. We generated a test construct encoding a cadmium sensitive promoter and a control construct encoding a constitutive promoter using recombinant DNA technology; both promoters controlled a pink chromoprotein as a reporter. Our construct was introduced into E. coli and exposed to various water samples to test responsiveness to cadmium contamination. Responsiveness was determined by evaluating the intensity of pink pigmentation that resulted from expression of the pink chromoprotein. A slight pink pigmentation was observed in both control and test constructs. The lack of responsiveness observed in our test construct could be due to the absence of cadmium in the water samples; however, pigmentation in the control was also fainter than expected. Further testing of both constructs in the presence and absence of purified cadmium is required.

Mathematics and Science.Biology.51

Elah MarieAlcuitas, ReginaMcGrane

Southwestern Oklahoma State University

Bacterial Terminator Efficiency and Expression of Two Reporter Genes

Terminator sequences regulate gene expression and contribute to genetic diseases and cancer development. In an effort to understand the mechanisms and efficiency of terminators, we characterized bacterial terminators in three synthetic biology constructs. Our test construct encoded a constitutive promoter, green fluorescent protein (GFP), terminator, and pink chromoprotein. Control 1 encoded the promoter, GFP, and terminator. Control 2 encoded the promoter, GFP, and pink chromo. A fluorometer was used to measure GFP fluorescence, and all constructs exhibited high-levels of fluorescence. We used a spectrophotomer and visible appearance to compare the expression of pink chromoprotein in all constructs and investigate the impact of terminators on gene expression. Control 1 did not show evidence of pink chromoprotein expression. Control 2 exhibited absorbance in the pink spectra and was visibly pink. The test construct showed minimal pink spectra absorbance and did not appear pink. The ability of Control 2 to exhibit both fluorescence and pink coloration suggests two reporter genes can be produced via the same promoter. The lack of pink coloration in our test construct demonstrates that the terminator can block the visual appearance of pink chromoprotein but is not strong enough to inhibit low levels of expression detected by the spectrophotometer.

Mathematics and Science.Biology.52

HannaHill, ReginaMcGrane

Southwestern Oklahoma State University

Using Synthetic Biology in the Detection of Antibiotics

Synthetic biology is an innovative field with many applications, including the detection of contaminants of environmental concern. The antibiotic tetracycline is used in cattle and humans, and its presence in the environment may impact development of antibiotic resistance. The objective of our research was to construct and test a tetracycline sensitive bioreporter by combining a tetracycline sensitive promoter and the reporter gene, amiCP, via recombinant DNA technology. The reporter gene amiCP encodes blue chromoprotein and produces a visible color when expressed. We hypothesize that our construct could be used to report the presence of tetracycline via repression of amiCP expression when in the presence of tetracycline. We made a construct expressing amiCP under the regulation of a constitutive promoter as a control. To evaluate our constructs, we exposed the test and control constructs to tetracycline, and detected amiCP expression. The control appeared blue; however, the test construct did not show visible signs of ampCP expression in any condition. Upon further investigation, we discovered that the tetracycline promoter lacked a ribosomal binding site; therefore, although expression of ampCP occurred, production of blue chromoprotein could not occur. Future work is required to add a ribosomal binding site to our construct.

Mathematics and Science.Biology.53

DentonParsells, VictoriaNavarre, ReginaMcGrane

Southwestern Oklahoma State University

Using Synthetic Biology to Investigate the Impact of Temperature on Gene Expression

Temperature is known to impact many important processes including the efficiency of the immune system. The objective of this work was to use synthetic biology to evaluate how temperature impacts gene expression. To do this we used recombinant DNA technology to generate two bioreporter constructs in E. coli, one that encoded a temperature sensitive promoter controlling the gene for red fluorescent protein (RFP), and another encoding a constitutive promoter controlling RFP. RFP is a protein found in sea anemones which fluoresces red following exposure to red light and causes a red pigmentation in bacterial cells. We hypothesized the construct containing the temperature sensitive promoter would vary in RFP production while the construct with the constitutive promoter would produce constant levels of RFP. To test each construct, we incubated replicate samples at four different temperatures: 20, 30, 37, and 42⁰C in broth and agar media. RFP expression was then evaluated at each temperature by visually scoring the pigment intensity of cells on agar media and by using a fluorometer to measure fluorescent intensity. Surprisingly, both of our constructs varied in RFP production in the temperatures tested. This suggest that either RFP or the constitutive promoter are also temperature responsive.

Taelor Kroeker, Jacqueline Young, and Dr. Ratnakar Deole

Northeastern State University

Bacteriocin Produced by Halobacteria from Great Salt Lake Inhibits Gram Positive Organisms

Antibiotic resistance is one of the major issues in nowadays community. Gram + bacterium like Methicillin-resistant Staphylococcus aureus(MRSA) is especially concerning due to fast mutation rates reducing the amount of potent antibiotics against it. Resistance of MRSA is attributed to misuse of antibiotics, and development of antibiotic resistance in nature, from MRSA’s frequent exposure to antimicrobial compounds within the same environment. Therefore, logical places to look for new potent antibiotics against Gram + organisms like MRSA are environments that MRSA does not inhabit, like hypersaline ecosystem, home of halophiles of all three domains of life. Great Salt Lake, Utah, harbors halophilic bacteria that produce antimicrobial compounds (bacteriocins) for nutrient competition elimination, which are active against MRSA. Antibiotic susceptibility and sensitivity assays were used to determine the domain of isolated microorganisms and whether they produce antimicrobial compounds. Protease test determined the nature of isolated antimicrobial compound. Tricine gel electrophoresis and contact bioassay were used to determine the size of the isolated antibiotic. Sample from Great Salt Lake showed the presence of bacteria producing bacteriocin which could be proteinaceous in nature. Bacteriocin was found capable of inhibiting the growth of Gram + bacteria grown in high salt. Its further characterization would help to better understand its mechanisms of action.

Mathematics and Science.Biology.55

DustiSloan, AndrewMaher, CariFryman, Timothy (TJ)Brawdy, AlexBenton, NikkiMorgan

Tulsa Community College

Viability Assay and Potential Effects of E-juice on Rat Lung Cells

The 2015 National Youth Tobacco Survey, conducted by the Centers for Disease Control, estimated that over 7 million adolescents have tried e-cigarettes. With limited data about the health effects of e-cigarette use, also known as “vaping,” the goal of this study was to determine the cytotoxicity of commonly used vape components on rat lung epithelial (RLE) cells. RLE cells were seeded and dilutions of vape base, nicotine, cannabidiol (CBD) oil, and a diacetyl-containing flavoring, “Space Jam” were added to RLE cells and incubated for five days. An MTT viability assay was used to determine whether these vape components were toxic to RLE cells. In general, vape base was not toxic to cells, except at the most concentrated 5% dilution. Cells incubated in 5% and 2.5% nicotine were significantly less viable than control. Cells exposed to 1.25% nicotine were not different from control, while cells incubated in 0.625% nicotine were significantly more viable than control. All dilutions (2.5%, 1.25%, and 0.625%) of CBD oil were toxic to cells. The more concentrated “space jam” flavoring treatments (2.5% and 1.25%) were toxic, while the 0.625% treatment was not different than control. These results provide greater insight into the potential harmful effects of vape components used in e-cigarettes. Given the dramatic increase in the use of e-cigarettes, it is important to continue in-depth studies on the toxicity of vape components.

Mathematics and Science.Biology.56

KayleaBixler

Oklahoma State University

Antibiotic Resistant Bacteria Isolated From Cystic Fibrosis Patients

Cystic Fibrosis (CF) is an autosomal recessive disease caused by a mutated Cystic Fibrosis Transmembrane Conductance Regulator (CFTR), which is a chloride ion channel. When the CFTR gene is mutated, it causes the protein to be absent or lose function, which leads to dehydration in the lung’s airways and also traps mucus inside the lungs. These conditions in the lung generate a perfect environment for bacterial colonization by multiple different species. Chronic bacterial colonization and development of antibiotic resistance are serious concerns for CF patients. Previous studies looking at antibiotic resistant bacteria focused on a specific genus species and it is possible that highly resistant bacteria were missed, whereas this study aims to identify overall resistant bacteria. This study aims to identify highly resistant bacterial populations directly from the sputa of CF patients in Oklahoma. Total bacterial populations from CF sputa were previously collected and cryogenically frozen. Samples from 41 patients were screened for high resistance to four antibiotics: Ticaracillin, Gentamycin, Polymixin B and Carbenicllin. Resistance was measured via Kriby-Bauer disc assays. A total of 11 highly resistant bacteria were identified which are currently being assessed for MICs and will be identified by 16S sequencing.

Mathematics and Science.Biology.57

SadeghNikfarjam

University of Central Oklahoma

Antibacterial properties of MgO nanoparticles immobilized polycaprolactone to Staphylococcus aureus

Titanium-based implants have been widely used in orthopaedics and orthodontic surgeries because of their strong mechanical, chemical and biological properties. We have invented a set of steps (e.g. grooving and oxidizing) by which a nanofiber matrix (NFM), composed of collagen (CG) and poly-ε-caprolactone (PCL) electrospun nanofibers, can be coated on a Ti implant without subsequent detachment. A significantly improved osseointegration of CG-PCL NFM-coated Ti over non-coated Ti was observed in our experiments. MgO NP shows promising antimicrobial properties with minimal toxicity1 and excellent biocompatibility with osteoblast cells in CG-PCL NFM and poly-methyl-methacrylate (PMMA) bone cement.2 Prolonged anti-bacterial activities of an implant are possible by tethering anti-bacterial molecules with the implant by microgrooving the implant and subsequently coating the implant with MgO NP tethered PCL NFM.3 The effect of MgO NP tethered PCL on the antimicrobial activities of PCL-NFM is not known, which then leads to this study. The goal of this study is to evaluate the antimicrobial properties of PCL without and with different concentration of MgO nanoparticles using Staphylococcus aureus (ATCC 6538).

Mathematics and Science.Biology.58

LauraPowell

University of Central Oklahoma

Isolation and Characterization of Gordonia Bacteriophages

Laura JoAn Powell, Umar Sahi, Hari Kotturi, and Ralph E. Jones

University of Central Oklahoma, Edmond, OK 73034

Bacteriophages (phages) are viruses, known to infect bacterial hosts. Many bacteria are used in a variety of areas such as nutrition, farming, and bioremediation. Our host bacteria is Gordonia terrae, found in soils, which has been investigated for bioremediation use. The purpose of this research is isolation and characterization of phages specific to Gordonia. We hypothesize that we should be able to isolate unique Gordonia phages from various soil samples. Gordonia terrae was grown on PYCa media at 28° C. Soil samples were processed using direct and enriched isolation. A plaque assay was performed to detect plaques (voids) in the host bacterial lawn, indicating bacterial cell death. Plaques from each sample were purified and amplified. Purified phages were viewed with a Transmission Electron Microscope to determine the phage morphology. The PCI-SDS method was used for DNA extraction, prior to sequencing. Restriction analysis was done using restriction enzymes. Our preliminary results suggest that we were able to isolate and purify two Gordonia bacteriophages from two soil samples. Both bacteriophages have Siphoviridae morphology with a long and flexible tail. The DNA of isolated phages will be sequenced to determine the uniqueness of our phages.

Mathematics and Science.Biology.59

LauraPowell

University of Central Oklahoma

Isolation and Characterization of Gordonia Bacteriophages

Laura JoAn Powell, Umar Sahi, Hari Kotturi, and Ralph E. Jones

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Mathematics and Science.Biology.60

EricPaul

Southwestern Oklahoma State University

What’s the Dirt about Antibiotic Resistance?

Two classes of chemotherapy are used against infectious diseases, synthetic drugs that are man-made in a lab and antibiotics, those that are derived from bacteria and fungi. Bacteria are capable of producing a variety of many different compounds in order to outcompete other microbes. Of the many components they produce, antibiotics have been of interest in many fields including medical and agriculture. Major advances in medicine and surgery due to antibiotics have saved patients’ lives by helping to extend life expectancy. However, pharmaceutical industries no longer consider antibiotic discovery an economically viable investment. The economics of producing new medication to treat antibiotic resistance is too high compared to medication for cancers, allergies, etc. Antibiotic-producing microbes can be found in many different environments. Soil microbes have been found to suppress or prevent many diseases caused by pathogens in agriculture or in livestock. Due to this extensive use of antibiotics, bacterial resistance has soon followed. Microbes would evolve to outcompete the antibiotic-producing microbes by synthesizing newer antibiotics that target these superbugs. In order to find a way to combat these resistances, new discoveries for antibiotics are needed. Soil has provided a great environment for undiscovered microbes. In this study, we are sampling soil in order to find antibiotic-producing microbes against common infectious pathogens.

Mathematics and Science.Biology.61

EricPaul

Southwestern Oklahoma State University

Assessment of the viruses in sewage

Sewage is an indication of the disease profile in a community. Enteric viruses, viruses found in the gastric intestinal tract of humans, are commonly transmitted fecal-oral route and are found in sewage. Some examples of enteric viruses in sewage sampling include polioviruses, enteroviruses, hepatitis A virus, echoviruses, reoviruses, etc. These viruses can cause a wide variety of diseases including hepatitis, encephalitis, myocarditis, meningitis. We expect to observe a seasonal change in disease profile. Using PCR, we analyzed sewage samples for the presence of Adenovirus, Enterovirus, Hepatitis A, Hepatitis G, and Rotavirus using specific primer sets. In addition, we also analyzed sewage samples for bacteriophages. Due to the inevitable escalation of antibiotic-resistant microbes, the use of antibiotics to eradicate/treat bacterial infections is becoming a daunting problem. After a new form of antibiotics is released, resistances in microbes soon follow. Thus, the popularity of phage therapy has reemerged. Phages, the natural pathogen of bacteria, can be used to lyse the membrane of the cell, not allowing resistance to occur. This project focuses on the identification of enteric viruses in the community’s sewage sample and the application of bacteriophages that are able to kill antibiotic resistant bacteria.

Mathematics and Science.Biology.62

KaylePatatanian

University of Central Oklahoma

Lynx rufus subspecies of Oklahoma: A genetic test of morphologically identified groups

Historically, three subspecies of Lynx rufus (bobcats) were recognized in Oklahoma. Subspecies identification relied on morphological differences, specifically pelage patterns and hair microstructure. A recent study has suggested only two subspecies of bobcats are present in the United States; however, samples from Oklahoma were not included in this study. Our study aims to determine whether the subspecies identified in Oklahoma, based on morphological characteristics, are supported by genetic data. To ensure an accurate population study on Lynx rufus in Oklahoma is conducted, we will use 19 microsatellite loci and one species identifier to compare hair samples collected from across the state. Genetic cluster analyses will be performed to determine the number of genetically distinct subspecies in the state.

Mathematics and Science.Biology.63

JaileneCanales

University of Central Oklahoma

Characterizing Developmental Defects in an Avian Model of Maternal PKU

Maternal phenylketonuria [MPKU] is a syndrome of multiple congenital anomalies including cardiovascular malformations [CVMs], brain and growth restriction when a mother with Phenylketonuria [PKU] does not control her dietary intake of Phenylalanine [Phe]. In this study, we aim to establish and characterize an avian model of MPKU. We focused on early developmental defects. METHODS: We investigated the effect of 2500μM Phe exposure by inovo yolk injection. Following the injection, the embryos underwent further development for 48 hours until dissection was performed. At HH14-17, India ink was injected into the yolk as a contrast dye. Images were taken of embryos and they were scored based on Drake et. al (2006.) RESULTS: Embryos exposed to high Phe displayed gross morphological changes including developmental and growth delays, anterior and posterior abnormalities, and torsion defects. FUTURE STUDIES: Histological analysis is underway to determine changes in heart development. Currently there is no data interrogating the mechanism by which Phe causes heart defects. We plan to utilize this model to define the mechanism of Phe cardiac teratogenicity which is critical for improving MPKU treatments and outcomes.

Mathematics and Science.Biology.64

ConnorSlattery

Southwestern Oklahoma State University

Effects of commonly used garden pesticides on the development of a sexually selected trait.

Little is known about how chemical contaminants affect the heritability of traits and understanding this interaction is vital to knowing how populations will respond to the presence of contaminants. We used a common garden insecticide to see how it affects the development and heritability of a sexually selected trait (the posterior gnathopod) in a freshwater amphipod species. Since sexually selected traits are large sinks for resources, they may be more sensitive to environmental change than other traits. We tested two amphipod populations from different environments that likely had different exposures to pesticides. Individuals from each population were raised in low concentrations of a commonly used insecticide, malathion. The concentrations used were within the range typically found in nature. We compared the enlarged gnathopod of males to two control traits: the smaller female gnathopod and a similar-sized trait, the proximal segment of a walking leg, both of which are not under sexual selection. The research will provide insights into how manmade changes affect aquatic ecosystems, and provide knowledge of how development of organisms, including human’s morphology, are affected by the presence of chemicals.

Mathematics and Science.Biology.65

KaylePatatanian

University of Central Oklahoma

Analysis of cardiac teratogenicity of phenylalanine using the avian model: the role of the focal adhesion pathway

Maternal phenylketonuria (MPKU) is characterized by the teratogenic effects of phenylalanine (Phe). High levels of intrauterine Phe cause cardiovascular malformations (CVMs), intellectual impairment, microcephaly, and low gestation mass. Mothers with PKU must maintain a strict diet to insure serum Phe concentrations remain below 360 µM to avoid these congenital defects. Previous functional genomic studies from our lab have determined the importance of the focal adhesion pathway (FAP) in the development of heart defects caused by MPKU. Our project aims to visualize mRNA expression during stages HH10-14 in chicken embryos using in-situ Hybridization (ISH). This will allow us to qualitatively assess the expression of genes associated with the FAP in heart and out flow tract (OFT) tissue. Hepatocyte growth factor, the ligand for c-MET tyrosine kinase receptor is one of six genes we identified and has been shown to promote angiogenesis. Also, other in-situ Hybridization studies have shown that HGF is present in the pharyngeal region of developing embryos. Our project goal is to characterize expression domains for all six differentially expressed FAP genes in Phe treated embryos.

Mathematics and Science.Biology.66

ShaylaMiller

Southwestern Oklahoma State University

The Battle of the Sexes: How Female Condition Affects Conflict Over Mate Guarding Duration in Hyalella Amphipods

Sexual conflict, different evolutionary interests between females and males, is common in nature and is expected to shape the evolution of mating traits and affect the productivity of populations. Most research has focused on male “offense” traits with relatively less research on female “defense” traits. We explored how female condition affects conflict over mate guarding duration in a freshwater amphipod species in the genus Hyalella. We hypothesize that females in poor condition will be exposed to longer mate guarding periods because they are unable to resist male pairing attempts. We will test this hypothesis by varying the amount of spirulina, a high nutrient protein powder, that is included in female’s diets. One group of females will receive a lower quality diet and the other group of females will receive a high-quality diet. A female from one of the two diet treatments and a male will be added to the same environment and pairing durations recorded. We predict females receiving the lower quality diet will have longer pairing durations. This research is important to understanding female trait that mediate sexual conflict over pairing duration in amphipod populations.

Mathematics and Science.Biology.67

MicahByrne

University of Central Oklahoma

Wiggledon: Isolation of a Microbacteriophage from Oklahoma Soil

A bacteriophage is a virus that infects and replicates within a bacterium. Due to the increase in drug-resistant bacteria, more research is being done on using phages for targeting various bacterial pathogens. This research provides valuable information regarding the isolation, amplification, and characterization of microbacteriophage Wiggledon. Wiggledon was isolated using Microbacterium foliorum as the host. The soil used for isolating phage was collected from a red wiggler worm farm in Oklahoma City, Oklahoma (35°29’6”N 97°35’29”W). The soil was then enriched with the host bacteria to amplify the virus. The phage was purified and amplified using multiple serial dilutions, spot plating, and webbed plate assays. The purified phage lysate was used for transmission electron microscopy, and its DNA was extracted using Promega Wizard DNA Clean-Up Kit method. In the future, we plan on sequencing the phage DNA using Illumina technology and annotating our phage genome using DNA Master. Here we report the isolation, amplification, and characterization of microbacteriophage, Wiggledon from Oklahoma soil. This study will help to expand the knowledge of bacteriophages in Oklahoma soil.

Mathematics and Science.Biology.68

EmilyBurgess

Southwestern Oklahoma State University

Comparative Rehydration of Vertebrate Natural History Museum Specimens

The Natural History Museum at Southwestern Oklahoma State University houses an important vertebrate zoology collection from the state of Oklahoma dating back to 1929. These specimens vary in quality of soft tissue conservation, including specimens preserved in liquid and desiccated states. For this study we replicated the rehydration procedure described by Singer (2014) to examine the effects of rehydration on different types of vertebrates. Specimens were selected from the collection based on their small relative size and condition, and include representation from fish, toads, salamanders, snakes and turtles. Dehydrated specimens were hydrated with DI water and thymol before being staged through increasing concentrations of ethanol. Preliminary results show consistent mass increases between 70% and 95% across the different organisms as well as a notable increase in pliability and improvement in physical appearance. These results support the utility of rehydration techniques in collections management as well as the recovery of specimens for research.

Mathematics and Science.Biology.69

FolasadeOlowe, CarolineBentley

University of Central Oklahoma

Analyzing and Developing Cultural Competency in Undergraduate Pre-Health Students

The American Association of Medical Colleges lists cultural competence as essential for students entering medical school so that they can provide quality health care to diverse people. Despite this, there are few studies about cultural competency in undergraduate students. The goal of this project is to assess cultural competence in undergraduate biology students at the University of Central Oklahoma, then provide them with opportunities that will assist them in increasing their cultural competence. A cultural competency survey was administered to 120 pre-health students. Results showed that 46% of the sophomores and 62% of the seniors had traveled abroad, but only 11% of sophomores and 44% of seniors reported the ability to speak more than one language. Furthermore, 36% of sophomore and 31% of senior pre-health students indicated they have taken a class that teaches about a different culture. However, 54% of the sophomores and 72% of the seniors indicated a desire to learn more about different cultures. Additional results are being compiled and will be presented. Also, a brochure is currently being created that lists university courses and minors that provide intercultural exposure. The brochure of recommended courses will be posted on the UCO website, as well as distributed to students during advising. Additionally, workshops are being planned at UCO to focus on the topics of cultural competency, implicit bias, and stereotyping in regards to race, gender, and sexuality.

Mathematics and Science.Biology.70

BrendanHarrison

Southwestern Oklahoma State University

How Sex Ratios Influence Pairing Duration in Hyalella amphipods

While sexual conflict research has exploded over the past few decades, we know relatively little about how demographics affect sexual conflict in nature. Sex ratio is a demographic parameter that can affect sexual conflict through male-female encounter rates, which will affect harassment levels experienced by females. The purpose of this study was to test the effects of sex ratios on pairing duration in a freshwater amphipod species in the genus Hyalella. We hypothesized that populations with male-biased sex ratio would experience longer pairing durations than populations with female-biased sex ratios. To test this hypothesis three habitats of replicated populations that vary in sex ratio will be set up: female-biased, male-biased, and equal sex ratios. Our hypothesis was formed because in a female-biased population females are more likely to resist male harassment, while in a male-biased population it becomes costlier in terms of energy to attempt to resist male harassment because more males will be harassing females. Therefore, females in the male-biased population may accept the costs of prolonged guarding periods over costly resistance to pairing. This study will serve to provide important insight into how changes in sex ratio change pairing behavior.