Mar 6th, 12:00 AM

02. Biology

Southwestern Oklahoma State University

The association of BMD, TBS, and bone fracture in osteoporosis patients among different ethnicities

Danrich Kruger & Ning Wu

Abstract

Osteoporosis brings more clinical significance over the world. Bone Mineral Density (BMD), a measurement of bone calcium level and density, has been the standard diagnostic method in Caucasian Americans (CA). However, it is not well fit for African Americans (AA), and Mexican American (MA). Trabecular Bone Score (TBS), a measurement of bone texture, has been integrated into osteoporosis diagnosis recently. This study retrospectively analyzed the association of BMD, TBS, and history of fractures among the populations of CA, AA, and MA by using NHANES 2005-2008 data. All patients were above 50 years old. The data of BMD and TBS were categorized upon the ethnics along with the history of previous fractures. The results showed that, in women, the BMD showed no significant change with the fractures among the three ethnicities, while an increased fracture rate was seen with worsening TBS category. In men, there was an increase in the prevalence of fracture with worsening TBS and BMD in all ethnicities. Both genders had an association between TBS/BMD category and previous fractures, which were much higher for CA than AA and MA. In conclusion, the association of fractures and TBS/BMD varied by race and gender. It would be more beneficial to evaluate the potential of fracture in osteoporosis patient by combining both TBS and BMD together. More research is needed for ethnicities and populations around the world to determine the weight of BMD and TBS in osteoporosis diagnosis.

Analysis of suicide incidence between Native American and United States total population

Tayler Hedgecock, Caitlin Cosby, & Ning Wu

Abstract

The suicide rates in Native American population have been known to be higher than that of US total population. This study focusses on exploring the different suicide rates between American Indian (AI) and US total population among age groups and gender. Numbers of suicide and total population were retrieved from CDC and US Census Bureau databases from 2006 to 2015. The percent of suicides contributed by AI to the US total suicide was 1.13-1.31%. The rate of suicide per 100,000 individuals in the population showed that the highest suicide rates occurred in the 20-24 age group for AI and 25-34 age group for US total population. The top three age groups for suicide rate were (1) 15-19, (2) 20-24, and (3) 25-34 with (2) > (1) or (3) in AI and (3) > (2) > (1) in US total population. Cross comparison of suicide rates amongst the gender groups showed that the highest rates for AI males were ages 20-24 followed by 25-34, while it was 45-54 followed by 55-64 for US total male population. The AI female population showed the highest suicide rates in the 15-19 and 20-24 age groups compared to 45-54 followed by 55-64 in the US total female population. Among all AI age groups, the male suicide rates were significantly higher than that of the females, except for the 10-14 age group where they were statistically similar to the top three age groups of 15-19, 20-24, and 25-34. In summary, the AI suicide rates substantially exceeded that of the US total population for age groups 44 and below.

The pathophysiological pathway of osteoporosis to provide early diagnose and treatment of osteoporosis for postmenopausal women

Ning Wu & Brittany Perez Vega

Abstract

The treatment of osteoporosis is continuing to expand by the production of new drugs and new methods of testing for osteoporosis. The research that has been conducted brings new insight for a more efficient treatment and accelerated diagnosis to patients, particularly postmenopausal women with osteoporosis, which have or show signs of osteoporosis. By determining the pathophysiological pathway of osteoporosis, the most suitable treatment for the patient may be determined to maintain the balance of bone resorption and new bone mineralization. To accelerate the process of diagnosing osteoporosis, it is crucial to understand the data collected in the testing done on the patient. The tests that are discussed in diagnosing osteoporosis are blood diagnostic test, the measurement of bone loss with the use of bone resorption markers, the measurement of bone formation by the use of bone formation markers. To provide better insight in treatment of osteoporosis the mechanism of the drugs used to treat patients with osteoporosis is discussed; in which the findings from the test used for diagnoses leads to the determinate drug for treatment that best suits the patient.

Algorithmic approach to incubation of Escherichia coli DH5α: Derivation of E. coli alpha formula

Darrin Wade, Ning Wu, & Stacie Oliver

Abstract

The goal of this study is to derive an original formula for expediting the lab used E. Coli growth rate. The DH5α strain with an expected optical density (OD600) range of 0.15-0.20 was applied. This desired OD range is critical for the following preparation of electrocompetent cells in the lab. The formula was derived from the standard equation that converts an OD600 to the amount of cells/mL. This formula will allow researchers to reach desired OD600 in 1-2 hours through 3-5 cell cycles. Several trials were conducted to confirm the fidelity of the formula. The formula includes a few steps, so it really is more of an algorithmic process. The variables in the formula take various unknowns into account: Concentration of stock bacteria, variable generation time, and number of bacteria to grow. This research is an initial step for further research in electroporation to create electrocompetent cells. The algorithmic steps include finding initial concentration of stock bacteria, adding a specific number of cells to 20 mL of LB media, and incubating at 37°C, 280 rpm for 1.5-2 hours. The E. coli alpha formula is as follows: (1) [Start OD600] x 5.0 x 108 = [Sample (cells/mL)]; (2) 1/[Sample (cells/mL)] x 8.0 x 107 = [Volume of bacteria (mL) adding to 20 mL of LB]. The result of this study can be used in small-scale, low-budget labs for them to prepare electrocompetent cells for their electroporation application.

Photoinducible Changes in Cell Morphology and Phenol Content Related to UVB Tolerance in Isolates of Zygnema (Streptophyceae)

Steven O'Neal

Abstract

Zygnema is a freshwater alga that forms thick mats that float at the water surface. Cells located at the surface of mats are exposed to very high visible light and UVB compared to cells deep within the mats. Previous studies have shown that Zygnema grown at high visible light and UVA levels shows increased tolerance to UVB exposure that coincided with an increase in UVB absorbance suggesting the photo-induced production of UVB protective compounds. We investigated whether visible light or UVA exposure induces changes in UVB absorbance and whether increased production of phenolic compounds is responsible for the absorbance changes. We exposed two Zygnema isolates to different light treatments: high light with UVA, high light without UVA, low light with UVA, and low light without UVA. After 7 days of exposure, cells were photographed and cell lengths measured. Weighed samples were extracted in methanol. The extracts were scanned with a UV spectrophotometer to determine UVB absorbance and quantitatively tested for total phenolic compounds. Zygnema isolates exposed to high light exhibited a 296% increase in UVB absorbance which coincided with a 255% increase in total phenolic content compared to samples exposed to low light. Removing UVA at high visible light exposure resulted in decreased phenolic content for only one isolate. Cell length decreased 51% in high light treatments. Removing UVA resulted in significantly larger cells only at low visible light.

Characterizing Bacteria of The Extremophilic Melting Pot Habitats of the McMurdo Dry Valleys

Teresa Mccarrell

Abstract

Life exists in nearly every niche on Earth, and Antarctica does not present an exception. Extremophilic bacterial communities are found in Antarctic habitats such as the permanently cold and hypersaline environments within and below permafrost and in subglacial water bodies. The ability of psychrotolerant ("cold-tolerant") and halophilic ("salt-loving") bacteria to survive and replicate in Antarctica has astrobiological implications, because similar conditions of extreme cold and hypersalinity are expected in places such as on Jupiter's moon Europa, or around and below the ice caps on Mars. For this study, samples were collected from various locales in the McMurdo Dry Valleys of Antarctica, including around Blood Falls, the moraine of the Taylor Glacier, and within the proglacial Lake Bonny. Experiments were conducted on nine isolates in order to characterize how psychrophilic and halophilic they were, by growing them on media of various salinities and at various temperatures. Nucleic acids were extracted from them to compare their phylogenetic relationships based on sequence identity of the 16S rRNA gene. Some have distinct phenotypes when grown on agar plates, such as bright pink pigment and or mucoidy colonies. These traits may help these organisms survive under conditions of strong UV radiation or limited nutrients. The unique adaptations of these bacteria that enable their survival in these environments could be similar to those exhibited by

Prevalence and Abundance of Gastrointestinal Parasites in Kiko kids goats from 16 States of the USA

Terry Gipson, Ryszard Puchala, Margaret Garcia-Gill, & Jessica Quijada

Abstract

Gastrointestinal parasitism is a multi-etiological infection being a major constraint in small ruminant production. The younger animals are especially susceptible as their immune system is not competent to cope with these infections. To determine the prevalence, composition and abundance of gastrointestinal parasites in Kiko goats, a total of 170 male kids (aged 4-6 month-old) were evaluated. Origin farms (n= 27) were located in 16 states of the USA. Individual fecal egg counts (Mc Master method) and pooled coprocultures (by state) were performed to identify the Strongylida genus. The higher prevalent were the strongyles nematodes 89.6% and protozoa Coccidia (Eimeria spp) 78.9%. Other observed helminths were Strongyloides papillosus 38.2%, tapeworms (Moniezia spp) 16.7%, Nematodirus spp 2.8% and whipworms (Trichuris spp) 1.4%. The fecal egg counts (FEC) for main parasites strongyle and coccidia were high (mean values: 2349.1 ±4553.3 EPG, 4460.3 ±9136.9 OPG, respectively) and showed an overdispersed distribution (coefficient $k < 8$) with few animals harboring the highest burdens. Infected animals with the high parasite burden for strongyles (EPG>1000) and coccidian (OPG>3000) accounted for 45.6% and 38.5%, respectively. From coprocultures identified species were Trichostrongylus spp, Teladorsagia spp, Oesophagostomum spp, Haemonchus contortus, Bunostomum spp and Chabertia sp. These epidemiological facts might be considered when control programs are planned.

Chronic Pesticide Exposure Alters Motility and Circadian Rhythms in Late Season Honey Bees (Apis mellifera L.)

Sahar Delkash-Roudsari & Ana Chicas-Mosier

Abstract

Honey bee pollination services, products, and management represent multi-billion dollar industries in the United States and Europe. These valuable pollinators are also experiencing population decline likely attributed to habitat fragmentation, pesticide application, and pathogens. Studies have shown negative impacts on behavior and survival following exposure to various pesticides however prior research has struggled with chronic exposure metrics. The Trikinetics Activity Monitor system allows individual honey bee tracking over the course of their entire captive lifespan. The present study uses this system to look at two-week aqueous exposure of glyphosate (herbicide active ingredient), RoundUp® (herbicide formula), imidacloprid (neonicotinoid insecticide), and ethion (organophosphate insecticide) and the impacts on minute-by-minute motility, daily circadian cycling, and survival. Imidacloprid negatively impacted all three metrics in exposed honey bees. Ethion showed little impacts on motility but reduced circadian rhythm adherence with no survival effects. Both herbicides showed dose-dependent results with RoundUp® effects being more severe than its active ingredient, glyphosate. The results of this study demonstrate the value of activity monitoring for insect species of economic or ecosystem concern. These data also demonstrate that chronic exposure to various pesticides may impact bees even at sub-lethal exposure concentrations.

Sublethal Imidacloprid Exposure Reduces Movement but not Learning in Late Season Honey Bees

Sarah Simons & Ana Chicas-Mosier

Abstract

Insecticides work through multiple mechanisms of action to target some insect species over others, however where we focus our work is where non-target organisms can be affected. Imidacloprid is the most widely used insecticide in the world and this study will investigate how it affects honey bees. Honey bees contribute nearly $20 billion to the value of U.S. crop production. This economic contribution comes from a production of crops for growers and American consumers. Neonicotinoid residues, such as imidacloprid, can occur in nectar and pollen which bees collect and take back to the hive, ultimately exposing all of the bees within the hive. Imidacloprid affects the neurotransmitters in honey bees, reducing their ability to move or think. We hypothesized that exposure to imidacloprid would negatively affect the honey bee's behavior when locating food and orienting. We used conditioning on honey bees exposed to a sublethal dose of imidacloprid (0.2mg/L) in 1M sucrose as compared to controls. Bees were placed in a Y-maze and recorded for the number of seconds spent in each arm of the maze as the bee moved through the apparatus. Our data showed that bees given a sublethal dose of imidacloprid exhibited paralysis. Therefore, showing just how dangerous imidacloprid could be to the honeybee population. A healthy beekeeping industry is important to a healthy U.S. agriculture economy.

Loss of Angiopoietin 4 protects from renal fibrosis in mouse model of ureteral obstruction

Myshal Morris

Abstract

Nearly 45% of all deaths in the developed world are attributed to some type of chronic fibroproliferative disease along with chronic kidney diseases (CKD) affecting over 10% of the worldwide population. Kidney fibrosis is the final common pathway of progressive kidney diseases, which results in subsequent significant destruction of the normal kidney structure and its function. Fibrosis of the kidney is caused by prolonged injury and dysregulation of the normal wound healing process in association with an excessive deposition of extracellular matrix. However, the exact mechanisms of CKD remain unclear due to the complexity of various contributing factors. Thus, the Angiopoietin 4 like protein (ANGPTL4) is being examined as a possible treatment solution as an effort to repair kidney fibrosis. ANGPTL4 is a protein that is used as a serum hormone for regulating lipid metabolism and previous research has shown it to contribute to wound healing in diabetic mice. So, in our study through using the Unilateral Ureteral Obstruction mouse model, (UUO) we want to systematically asses the implications of kidney fibrosis interacting with ANGPTL4. After performing UUO we identified the effects of ANGPTL4 KO comparatively with wild type ANGPTL4 through western blot and qPCR analysis. Our results conclude with ANGPTL4 wild type having much lower fibrosis than that of the ANGPTL4 KO which may help improve future understandings of the mechanisms of kidney fibrosis.

Effects of imidacloprid, ethion and glyphosate on associative learning in honey bees (Apis mellifera L.) using Electric Shock Avoidance

Ana Chicas-Mosier & Sahar Delkash-Roudsari

Abstract

Honey bees (Apis mellifera) play an important role in agriculture worldwide. These organisms are in decline, especially in the U.S and Europe and this has been attributed to several factors including agrochemicals. A growing human population and subsequent need for more crop production have led to widespread use of agrochemicals and there is growing concern that pollinators are being affected by these pesticides. The present study compares sub-lethal and lethal dosages of imidacloprid, ethion, and glyphosate on aversive learning in honey bee foragers. In a controlled laboratory environment, we observed honey bee choice following aversive and neutral stimuli paired with color (a blue/yellow shuttle box design) following acute oral treatment of imidacloprid, ethion and glyphosate at two concentrations each. We found that imidacloprid and ethion have negative impacts on aversive learning following a single-dose of pesticide. It was also observed that honey bees have a yellow bias, an unexpected result for the subspecies and region of the study. Overall, the results suggest that short-term exposure to concentrations of imidacloprid and ethion adversely affect honey bees foragers.

Comparison of suicide death rate between Native American and United States total population

Ning Wu, Caitlin Cosby, & Tayler Hedgecock

Abstract

The suicide rates in Native American population have been known to be higher than that of US total population. This study focuses on exploring the different suicide rates over the total death between American Indian (AI) and US total population among age groups and gender. Numbers of suicide and total death were retrieved from CDC and US Census Bureau databases from 2006 to 2015. The percent of suicides contributed by AI to the US total suicide was 169-193%. The rate of suicide per total death showed that the highest suicide rates occurred in the 15-19 age group for AI and US total population. The top three age groups for suicide rate were (1) 15-19, (2) 20-24, and (3) 10-14 with (1) > (2) = (3) in AI and (1) > (2) > (3) in US total population. Cross comparison of suicide rates amongst the gender groups showed that the highest rates for AI males were ages 15-19 followed by 20-24, and the same is shown for the US total male population. The AI female population showed the highest suicide rates in the 10-14 age group followed by the 15-19 age group compared to the 15-19 followed by 20-24 age group in the US total female population. Among all AI age groups, the male suicide rates were significantly higher than that of the females. In summary, the AI suicide rates substantially exceeded that of the US total population for age groups 24 and below.

Anti-carcinogenic Effects of Dandelion's Extract on HeLa Cells

Mel Vaughan, Chandler Newton, Giulia St. Peter, & Christina Hendrickson

Abstract

Some plant-derived products have pharmaceutical uses for anti-carcinogenic properties. Some of them like dandelion (Taraxacum officinale) are well-tolerated and safe for consumption. Dandelion is well-known among Middle Eastern and Chinese people for its anti-inflammatory and anti-carcinogenic effects and is consumed as tea and salad. It is unclear what is the mechanism of effect on cancer cells themselves though. This study investigated the anti-carcinogenic effects of dandelion on HeLa cells. The hypothesis is that the anti-cancer activity of dandelion extract acts by disrupting key cellular processes in tumor cells, which could result in growth inhibition and apoptosis. Dandelion Whole Extract (DWE) was prepared, filtered, lyophilized and resuspended in growth media. HeLa cells and normal human dermal cells (HDF, as control) were maintained under standard conditions then treated with different concentrations of DWE from 8 to 0 mg/ml for 96 hours. Cells were assessed for proliferation, apoptosis, and cell migration. Our results showed that DWE at the dose of 4 mg/ml and lower inhibited proliferation while promoting apoptosis in HeLa cells, but not HDF cells. Cell migration assay showed significant inhibition of HeLa cell migration while HDF cells were not affected and were able to fill in the wound scratch gap in 48 hours. This study supports the possible use of dandelion as a natural source of anti-carcinogenic compounds against cervical cancer.

CHO Cells vs Insecticides and Herbicides: A 120-hour Fight to the Death

Meghan Garner, Bela Hadley, Todd Mangile, Dusti Sloan, Cassandra Ortiz, Huxley Rainwater, & Michelle Xiong

Abstract

Over the last few decades, the use of pesticides, which include herbicides and insecticides, has skyrocketed. With this increase, there is growing concern that wildlife and humans could be adversely affected by residual chemicals. The goal of this study was to determine the cytotoxicity of commonly used crop chemicals on Chinese hamster ovary (CHO) cells. CHO cells were seeded in 96-well plates at 1x104 cells/mL and allowed to adhere. Roundup (glyphosate), Sevin (carbaryl), and Bayer Advanced Garden (neonicotinoid) were diluted in growth media to concentrations of 10%, 5%, 2.5%, 1.25%, and 0.63%. CHO cells were exposed to these chemicals for 120 hours. An MTT viability assay was used to determine whether the chemicals were toxic to CHO cells. Cells incubated in all concentrations of Roundup (herbicide) and Bayer (insecticide) were significantly less viable than control. Cells incubated in Sevin (insecticide) concentrations greater than 2.5% were significantly less viable than control. These results indicate that chemicals commonly used on crops could be detrimental to wildlife and humans. Given the dramatic increase in the use of pesticides, it is important to continue in-depth studies of chemicals used to treat crops.

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

Kadin Falkensten, Dusti Sloan, & Timothy Brawdy

Abstract

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.

MeCP2 Plays Crucial Role in the Hypermethylation of the GLS Gene in the TNBS Treated Animals

Christy Eslinger

Abstract

Approximately 3 million Americans suffer from some form of inflammatory bowel disease (IBD), chronic inflammation resulting in hypersensitivity and loss of mucosal layers in colon. We have documented an increase in the expression of glutaminase (GLS) gene in the 2,4,6-trinitrobenzenephonic acid (TNBS)-induced colitis in rats. We found there is a CpG island in the promoter region of the GLS gene, which overlaps with the coding region. This led us to believe that DNA methylation may be playing a crucial role in the modulation of the GLS gene expression. TNBS-induced colitis increased methylation of the CpG island resulting in increased GLS gene expression. Treatment with Azacitidine (Aza), a demethylating drug, resulted in a significant decrease in the hypermethylation. Methyl-CpG binding protein 2 (MeCP2) proteins are known to be interacting with methylated CpG dinucleotides. Utilizing a modified ChIP assay followed by a bisulfide conversion and a methylation specific PCR (MSP), we confirmed that MeCP2 directly interacts with the methylated CpG dinucleotides in the promoter region of GLS gene. These results suggest that demethylating agent, Aza, Can be potentially used for reducing inflammation and alleviating pain in IBD patients.

KIX Domains as a Targeted Motif For HTLV-1TAX AD Mediated Proviral Activation

Justin Harris

Abstract

Human T-cell leukemia virus type-1 (HTLV-1) is a retrovirus which can cause Adult T-cell Leukemia/Lymphoma (ATL). Activation of the provirus is controlled through a minimal viral promoter with transcriptional enhancer elements recognized by host proteins and the virally expressed oncoprotein, Tax. This Tax stabilized activator complex then goes on to strongly recruit the coactivator protein (CBP/p300) to form a large complex. It is known mutations in the activation domain of Tax (Tax-AD) causes loss of transcription ability but still can fully recruit the activator/coactivator. CBP/p300 contains a KIX domain known to interact with Tax. Previous papers ruled out this Tax activation domain (AD) interaction with KIX, but preliminary results implicate the TaxAD-KIX interaction was masked from discovery. This project looks deeper at the KIX domain and a broader defined KIX (KIX-LONG) to better understand the differences in the published and preliminary work. The role of Tax-AD interfacing with KIX as it relates to transcriptional activation remains unexplored, as well as the potential impact of Tax-AD with KIX homologs. Structural analysis of the KIX domain has identified several “KIX-like” homolog domains in other transcriptional co-activators, implicating a viral multi-step targeting of transcription. Examining the KIX domain homologs will allow exploration into HTLV Tax-AD affinity for KIX-like structures predicted to result in the high viral transcription activati

Identification of Potential Antibiotic to Inhibit Enterococcus Growth

Constance Green

Abstract

The goal of this study is to find novel antibiotics to treat Enterococcus faecium bacterial infections. Initial tests from sixteen soil samples found four bacterial isolates that show inhibition of E. faecium growth. Soil was used because soil has high levels of bacteria known to produce antibiotics. Identification of these isolates using staining and oxygen requirements indicates that all four isolates are Gram positive, endospore-forming bacilli in the Genus Bacillus. Follow-up studies using top agar-cellophane method verified that one of the isolated strains was capable of secreting an antibiotic to inhibit E. faecium growth on solid media. Because it is easier to extract antibiotics from liquids, current studies are to determine whether extracts from liquid media will inhibit E. faecium. Finally, the potential antibiotic will be identified from either solid or liquid extracts.

The Potential Adaptive Significance of UV Reflective Morphology in Insectivorous Bats

Carlie Jennings

Abstract

Communication in the ultraviolet spectrum has an array of adaptive functions such as foraging, social signaling, etc., and is known to occur in a wide variety of taxa. However, it has not been well studied in mammals. As a result, the prevalence of ultraviolet (UV) communication in mammals remains poorly understood. UV communication requires a social signaling mechanism, such as UV reflective morphology as well as a visual system capable of interpreting wavelengths in the upper UV range (390 nm). Using a UV photography protocol to qualitatively measure UV reflectance of pelage, several bat species were found to possess UV reflective morphology. However, the function of this UV reflection remains unknown. In bats, potential functions include species recognition or prey attraction, among others. We propose that UV reflection is more prevalent in insectivorous bats as an adaptive function of attracting insects. The degree of UV reflectance of species with insectivorous and frugivorous diets was compared using a X2 analysis to investigate the presence of a significant relationship between degree of UV reflection and diet. Results herein suggest that UV reflectance has a higher prevalence in insectivorous than frugivorous species. Because UV reflectance increases the risk of detection by predators, UV reflective signals are likely under strong selective pressure; therefore, there must be some adaptive benefit to possessing such morphology, though further investigation is need

Parasites from Large Intestine of Trachemys scripta elegans as Identified using a Scanning Electron Microscope

Dakota Cao

Abstract

Testudines are a heavily parasitized group of poikilotherms and are commonly host to multiple species infection. Much of the available data on the helminth parasites of Oklahoma Testudines is more than fifty years old. Our research is intended to find out anatomical structure and identification of Testudine parasites from the stomach and large intestine using a scanning electron microscope.

Fifty Red-Eared slider turtles (Trachemys scripta elegans) were collected from five counties in Southern Oklahoma and one county in Eastern Texas. One common snapping turtle, Chelydra serpentina serpentina, was also collected from Garvin County, Oklahoma. These testudines size and sex were recorded, dissected, and organs inspected for parasites. The parasites from the stomach and large intestine will be critical point dried, mounted on stubs, and examined using the scanning electron microscope to assess variation within individuals and identify taxonomic status.

Once valid identification is found for all species, then Analysis of Variance (ANOVA) and t-tests will be conducted to assess associations between geographical location of the host and total parasite load per Testudine host. Simple linear regression analysis will be used to compare size of hosts to number of parasites.

CLUSTERS OF HEALTH OUTCOMES MAPPED BETWEEN 2014 AND 2016 IN TULSA, OKLAHOMA

Michael Poindexter & Mona Easterling

Abstract

Ryne Ashworth, Sophie O'Reilly, Christian Poindexter, Mona Easterling
Tulsa Community College Department of Biology

The use of publicly-accessible data provides an opportunity to examine the number of adult respondents (≥18 years) in our city who report 14 or more days during the past 30 days in which their mental health was not good. The 500 Cities Project has incorporated multi-level regression and post-stratification to link geocoded health surveys to produce local level health related estimates. Our hypothesis is that mapping 500 Cites Project data both 2014 and 2016 within the city of Tulsa will show a clustering effect within the city based on census tract. Evidence has shown mental disorders are strongly related to the rates of many chronic diseases including diabetes, cancer, cardiovascular disease, asthma, and obesity. Mental health is an important component of health-related quality of life (HRQOL), a public health concept focusing on health status impacts on quality of life. Maps of the city of Tulsa show clustering of negative mental health outcomes north of Interstate Highway 244 in both reporting years. In these areas, poor mental health outcomes exceed the local average. Oklahoma consistently reports a higher percentage of poor mental health outcomes than the national average in the CDC's Behavioral Risk Factor Surveillance System data.

Identification and Homology Modeling of a Putative Substrate Binding Protein From Streptococcus sanguinis, a Pathobiont Involved in Infective Endocarditis

Camille Goerend

Abstract

Streptococcus sanguinis is a pathobiont associated with healthy oral biofilms and is the leading cause of infective endocarditis in humans. S. sanguinis expresses a variety of cell surface proteins, most of which still remain uncharacterized. One such cell-surface protein with unknown function is SSA_0908, which is annotated as a single-pass transmembrane protein with similarities to ABC transporter substrate binding proteins. The goal of this project is to elucidate the putative function of this protein by sequence analysis and homology modeling.

SSA_0908 is a 35.2 kDa protein with a conserved domain typical of type 1 periplasmic binding proteins. Protein secondary structure analysis showed structural homology to binding proteins involved in amino acid and sugar transport. Pairwise alignment of SSA_0908 with its closest homolog from S. pneumoniae revealed highly conserved residues involved in substrate binding. Substrate specificity in the homologs of SSA_0908 is dictated by glutamine residue, which is involved in hydrogen bond interaction with the imidazole ring of the substrate. This important residue is also conserved in SSA_0908 indicating that the preferred substrate for this protein is probably an aromatic amino acid. The over-all structure of SSA_0908 is typical of substrate binding proteins with two domains composed of sandwich fold connected by a hinge loop. Substrate binding site is located at the interface of the two domains.

Survey of Ixodes scapularis associated pathogens from Odocoileus virginianus at Lake Arcadia in Edmond, Oklahoma.

Russell Smalley IV

Abstract

Odocoileus virginianus (white-tailed deer) is the primary host and vector for Ixodes scapularis (deer tick). Most of the research into Ixodes scapularis has been geographically restricted to the northeastern United States with limited interest in Oklahoma until now as the Ixodes populations spread. Ticks serve as a vector for pathogenic bacteria and viruses that pose a significant human health risk. To date, there has been no research to determine what potential tick-borne pathogens are present in Ixodes scapularis at Lake Arcadia. Using a one-step multiplex real-time reverse transcription-PCR we will test for five potential pathogens in Ixodes scapularis collected from harvested white-tailed deer.

Extracts from Sea Sponges Inhibit Fibroblast Migration

Makayla McGuire

Abstract

Fibroblasts are the primary cells present in connective tissues of the body and they 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, one of the properties of fibroproliferative diseases. Fibroblasts were plated in an elastomer plug migration assay and incubated at 37°C 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. 17 extracts have been tested to date; of these, 5 have inhibited migration. Our goal is to isolate the active ingredients from these 5 extracts using chemistry separation techniques. 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

Anti-carcinogenic Effects of Dandelion's Extract on HeLa Cells

Christina Hendrickson

Abstract

Some plant-derived products have pharmaceutical uses for anti-carcinogenic properties. Some of them like dandelion (Taraxacum officinale) are well-tolerated and safe for consumption. Dandelion is well-known among Middle Eastern and Chinese people for its anti-inflammatory and anti-carcinogenic effects and is consumed as tea and salad. It is unclear what is the mechanism of effect on cancer cells themselves though. This study investigated the anti-carcinogenic effects of dandelion on HeLa cells. The hypothesis is that the anti-cancer activity of dandelion extract acts by disrupting key cellular processes in tumor cells, which could result in growth inhibition and apoptosis. Dandelion Whole Extract (DWE) was prepared, filtered, lyophilized and resuspended in growth media. HeLa cells and normal human dermal cells (HDF, as control) were maintained under standard conditions then treated with different concentrations of DWE from 8 to 0 mg/ml for 96 hours. Cells were assessed for proliferation, apoptosis, and cell migration. Our results showed that DWE at the dose of 4 mg/ml and lower inhibited proliferation while promoting apoptosis in HeLa cells, but not HDF cells. Cell migration assay showed significant inhibition of HeLa cell migration while HDF cells were not affected and were able to fill in the wound scratch gap in 48 hours. This study supports the possible use of dandelion as a natural source of anti-carcinogenic compounds against cervical cancer.

The Benefits of Sleeping

Phoenix Braswell

Abstract

Some people believe that if they stay and study and get about four hours of sleep, wake up and drink a cup of joe, they will have the same chances as someone who's had a full 8-9 hours' of sleep, but they don't. Other than being tired people who don't get enough sleep put their health at risk in ways they don't even know. Sleep keeps your heart healthy mainly by the way it interacts with the blood vessels, to which a lack of sleep can your blood pressure and cholesterol which are factors of heart attacks and strokes. It can also help to prevent cancer.

Documentation and Genetic Analysis of a Population of Mediterranean Geckos (Hemidactylus turcicus) at the University of Central Oklahoma and Surrounding Buildings

Samah Houmam, Briant Nguyen, Madison Birdwell, Allyson Fenwick, & Mari Nguyen

Abstract

The Mediterranean gecko (Hemidactylus turcicus) is a small lizard that was introduced to the University of Central Oklahoma (UCO) but has not yet spread to all buildings on campus. It is an exotic, nocturnal species native to the Middle East. We conducted comprehensive surveys of UCO and off-campus buildings around it, detecting colonization in 12 buildings with no previous records. We documented the spread of geckos to 30 buildings on campus and six buildings off-campus in the surrounding community. We collected 34 samples at UCO this semester, making our grand total over a thousand tissue samples. Analyses utilized STRUCTURE and ARLEQUIN software and standard genetic diversity and differentiation tests. Based on preliminary analyses, we found evidence of multiple subpopulations of Mediterranean geckos, but each building was not genetically isolated. We expect the pattern to continue with new samples because the slow migration and physical separation of the geckos increases the probability of subpopulations. We expected populations further from Howell Hall, the introduction site, would show less genetic variation due to a repeated founder effect. However, all populations were similarly low in variation. This project continues to monitor and document the geographic and genetic progress of a population of exotic species as it slowly expands. Data generated will help answer questions about other exotic and possibly harmful species and their adaptations to urban areas.

Evaluating environmental factors influencing the distribution of Mediterranean geckos (Hemidactylus turcicus) at the University of Central Oklahoma

Briant Nguyen, Samah Houmam, Allyson Fenwick, & Madison Birdwell

Abstract

The Mediterranean gecko (Hemidactylus tucicus) is a small nocturnal vertebrate that originates from the Middle East. Since being introduced to the United States, the Mediterranean gecko has spread all across the country, with Oklahoma being near the expected northern-most range edge in the central region. Within the invaded range, these geckos primarily occupy vertical man-made structures which provide increased light and temperature and contribute to spreading beyond the areas where geckos should be able to range. The Mediterranean gecko is a great test subject as it seems to establish quickly in a site but expands slowly. Understanding the environmental factors affecting these geckos near the edge of their range will contribute to studying adaptation. This project builds on a previous body of data measuring Howell Hall, the original introduction site on campus. We predict that geckos on all buildings will show the same patterns of perch use: little difference between perch and wall temperatures, perch temperatures being warmer than ambient temperatures during cold nights, and little difference between perch lighting and ambient lighting. We expand environmental information to nine other on-campus buildings. We aim to compare perch temperature and light between buildings to understand how Mediterranean geckos are responding to environmental factors at UCO, an extremely local scale.

Effects of Cotinine, a Nicotine Metabolite, and Hyperglycemia on Gingival Fibroblasts In Vitro

Nolan Henning

Abstract

Smoking and diabetes mellitus have been shown to have negative effects on oral wound healing, in part by impairing the function of gingival fibroblasts (GFs). Cotinine, the primary metabolite of nicotine, has also been shown to impair the function of GFs, and we predicted that cotinine's deleterious effects on healing would be more severe in hyperglycemic environments. The effects of cotinine and hyperglycemia were studied using an in vitro wound model to determine if they alter the rate of wound repopulation. We then used video microscopy to observe the behavior of individual cells treated with cotinine and/or hyperglycemia, and F-actin was labelled in cells using fluorescently conjugated phalloidin. Wound repopulation, cell areas, and levels of F-actin were quantified using the NIH ImageJ software. Our data indicate that hyperglycemic conditions adversely affect wound healing in vitro and impair the function of GFs when combined with cotinine. Whereas cotinine alone appeared to accelerate healing, the rate of repopulation was impaired in all wounds treated with cotinine and hyperglycemia. Similarly, cotinine was shown to cause rapid cell contraction when applied to cells grown in hyperglycemic conditions. Short-term and long-term exposure to cotinine had varying effects on levels of F-actin, but hyperglycemia produced consistently lower levels of F-actin and the combination of cotinine and hyperglycemia produced a sustained increase in cellular F-actin.

The Adverse Effects of Antibiotics on Oral Wound Healing

Julia Murray

Abstract

Antibiotics, mainly amoxicillin and clindamycin, are frequently prescribed to patients undergoing oral surgery or dental cleanings as a preventative measure for infections. Although they do provide additional protection against infection, antibiotic use is not without risk. Over-prescription of antibiotics can lead to microbial imbalance of the gut and antibiotic resistance. However, the effect of these antibiotics on healthy cells in an oral wound has not been significantly studied. This study investigated the potential adverse effects antibiotics may have on oral wound healing when given prophylactically. Using the in vitro wound model and gingival fibroblasts, artificial wounds were treated with different concentrations of amoxicillin and clindamycin as would be present in saliva after antibiotic treatment. Every 24 hours, digital images of in vitro wounds were recorded and the cell media were changed, replenishing the levels of antibiotics present. Using the NIH Image J software, the series of wound images were analyzed to determine the rate of wound repopulation. Our results show that administering amoxicillin and clindamycin during the process of wound healing at both low and high concentrations slows the rate of wound repopulation and affects morphological characteristics of the cells.

Development of a Paper-Based Flow Assay for Detection of Staphylococcal Enterotoxins in Food

Mary Tappert & Caitlyn Ransford

Abstract

The goal of this study is to make a paper-based test, similar in concept to a home pregnancy test, for home users and the food service industry to use in the detection and prevention of Staphylococcus aureus enterotoxin food poisoning. A series of ELISA assays determined that the toxin, grown in a bacterial culture broth, can be sandwiched between a monoclonal anti-enterotoxin antibody and a polyclonal anti-enterotoxin antibody and detected a a dilution factor of at least 1x106 . A flow strip is being developed using these antibodies to detect the presence of Staphylococcus aureus enterotoxins in a sample of food.

Using Axenic Media to Determine how C. burnetii is Adapted to Life in an Intracellular Environment

Melissa Brewer & Erika Lutter

Abstract

Coxiella burnetii is an obligate intracellular bacterium and the causative agent of Q fever. It is well established that C. burnetii undergoes a “phase transition” from virulent (phase I) to avirulent (phase II) caused by truncation of LPS. Phase I C. burnetii undergoes this phase change when passaged in embryonated eggs or tissue culture. Recently, an axenic media, Acidified Citrate Cysteine Media (ACCM), was developed allowing for the growth of C. burnetii outside of the host cell. It has also been shown that the phase transition occurs when phase I C. burnetii is passaged in ACCM. However, it is unclear what other molecular systems may change when the stressors of a cellular environment are removed. We used a reverse evolution approach to address this gap in our understanding of how C. burnetii adapts to life within a host cell during infection. We hypothesized that global protein changes would occur during early and long-term passages after inoculating ACCM with host cell propagated C. burnetii. Following passages in ACCM, we found that the number of infectious units decreased, protein changes were detected in mass spec data with the first five passages and that significant reduction of proteins known to be necessary for infection could be detected by western blotting within the first ten passages. We have found that early changes are occurring following passages in ACCM, leading to a promising avenue to study how C. burnetii is adapted to the intracellular e

Establishment of Long-term Vegetation Sampling at UCO's Selman Living Lab to Analyze the Impact of Plant Cover, Community Composition,and Ground Cover on Small Mammal Populations

Vatsal Lotwala, Gloria Caddell, & Chad King

Abstract

As part of a long-term study of factors impacting small mammal population and community persistence, plant cover, plant community composition, and ground cover are being monitored at the Selman Living Lab, UCO's biological field station in the Cimarron Gypsum Hills in Woodward County. Each season, vegetation and ground cover are sampled by a point-intercept method at 600 points on three permanent webs: gypsum outcrop, grassland, and gypsum outcrop/grassland. Data from March 2018 through January 2020 show that plant cover was highest in the grassland and lowest on the outcrop. Sixty-nine species (20 graminoids, 45 forbs, 3 shrubs, 1 tree) were encountered, of which 97% were native. The highest number of species was on the grassland web and the lowest number on the outcrop. Only 14 species were common to all three webs, and Sorenson's community similarity for pairs of webs ranged from 50-57%. Cryptogamic crust represented the highest percent ground cover on the outcrop, whereas litter represented the highest percent ground cover in the grassland. The number of species and the number of graminoids and forbs encountered during the 2019 growing season was higher than in 2018 for all webs. Changes in vegetation between the two years might be due to an increase in precipitation from 2018 to 2019, and recovery from fires that occurred in 2016 and 2017. The vegetation data will be used in mathematical models to help identify the impact of vegetation on rodent populations.

Characterization of the impact of syringafactin on human pathogen chemotaxis and membrane permeability

Regina McGrane

Abstract

Pseudomonas syringae is a bacterium that can colonize leaf surfaces and cause plant diseases. Under cool, moist conditions P. syringae can induce motility and enter plant tissues becoming a disease-causing pathogen. P. syringae secretes lipoproteins called biosurfactants. The biosurfactant syringafactin has been shown to enhance surface motility and promote nutrient and water diffusion from plant cells. Our laboratory has demonstrated that syringafactin repels and kills competing bacteria, suggesting it may be useful for treating bacterial infections. The objective of this work was to investigate the mechanisms of repulsion and identify how syringafactin kills bacteria. Results demonstrated that repulsion occurs via the competitor's chemotaxis pathways. The minimum concentration of syringafactin required to kill the human pathogens Salmonella enterica, Pseudomonas aeruginosa, and Escherichia coli was identified. Syringafactin can kill P. aeruginosa at much lower concentrations compared to concentrations required to kill E. coli. Antimicrobial biosurfactants produced by other bacteria increase cell permeability leading to cell lysis; therefore, the impacts of syringafactin on membrane permeability was tested. Each human pathogen exhibited increased membrane permeability following syringafactin exposure. Collectively, this work aims to evaluate the potential use of syringafactin as an antimicrobial agent in the prevention of disease outbreaks.

Observing the Presence of Ultraviolet Reflectance in Crepuscular and Nocturnal Strigiform Plumage

Bailey Kephart

Abstract

Strigiformes have been established as capable of interpreting ultraviolet light without ultraviolet sensitive (UVS) cones, however not much is known about how owls utilize and interpret UV reflection. In this study, I analyzed the presence of UV reflectance in four owl species, with two deemed as nocturnal and two deemed as crepuscular in activity. To find UV reflectance, I photographed specimens from various ornithological collections with a UV-sensitive lens. I then recorded the presence or absence of visible UV coloration and compared the results with a X2 goodness-of-fit test. I found no statistically significant difference among nocturnal and crepuscular species observed, as the majority of specimens reflected UV light in some variance. Because the majority of owl specimens in this study reflected UV light regardless of crepuscular or nocturnal activity, it is possible that owls that are active at night, dawn, and dusk all have the ability to engage in intraspecific UV communication.

Pattern Recognition: How Exposure to Patterns Alters Reaction Time

Shiny Christian

Abstract

Pattern recognition describes the cognitive process matching information from a stimulus with information retrieved from memory. This experiment examines whether the number of times a subject is exposed to a pattern will affect the amount of time it takes to recognize and react to changes in that pattern. We hypothesize the reaction time to recognize and deactivate lights in a pattern will decrease. We also hypothesize the accuracy of deactivating lights in a pattern will increase with repeated exposure. In this experiment, 10 people were asked to recognize a change in patterns throughout 3 different trials. Each person had 3 trials with 3 different patterns for each trial. They had 4 seconds to memorize the pattern and 6 seconds determine the change in the pattern. Data analysis indicates as females are exposed to a pattern over time, their ability to recognize changes in that pattern increases. Subjects were more likely to choose the correct light over time. Subjects made fewer wrong choices the more they were exposed to the original pattern. There is a correlation between the increase in correctness and a lack of wrong choices. No significant increase in reaction time between trials was found.

Farming and the Hygiene Hypothesis

Gunner Parent

Abstract

The increased prevalence of allergic disease over the past decade, and the claims of the hygiene hypothesis, has led to increased allergy research in relation to different environments. We conducted a retrospective chart review to statistically determine whether growing up on a farm provides a protective effect against allergies based on the hygiene hypothesis. Data collection consisted of an SQL query. All patients from a single rural ENT Allergist in Southern Oklahoma from 2012-2018 are included in the study. Patient data was de-identified and formatted in excel for statistical analysis. Python software was utilized to determine the significance between patients who grew up on a farm and patients who did not grow up on a farm in relation to having allergies. Our results determined a statistical difference between the prevalence of allergic rhinitis in patients who grew up on a farm and patients who did not grow up on a farm (p value = 0.000302). Our results revealed that patients who grew up on a farm were more likely to have allergies compared to patients who did not grow up on a farm. In our patient population, those who did not grow up on a farm were statistically less likely to have allergic rhinitis compared to patients who grew up on a farm. A possible confounding variable for our findings may be incidental exposures to farming environments due to living in close proximity to local farms.

Invasive fungal species imported on melons from Guatemala

Patrick McDowell

Abstract

Melons (Cantaloupe; Cucumis melo var. cantaloupensis) were purchased from local grocers in 2016-2019 and observed for post-harvest diseases, specifically fungal diseases. Of the 80 melons purchases in 2019, approximately 75% developed fruit rot symptoms caused by fungi. The diseased tissue indicated that the majority of lesions were causes by Diaporthe spp., and to a lesser extent lesions were caused by Alternaria and Fusarium spp. Plant pathogens such as Diaporthe spp. enter the surface of the melon fruit early in developmental stages and remain latent until the fruit matures. While ripe fruit is imported with no external evidence of disease, internal fruit rot becomes evident as the fruit matures. The objective of this study was to characterize those fungal species imported via Guatemalan melons. Fungal isolates were characterized based on culture growth characteristics, spore morphology, and DNA analysis. A majority of Guatemalan isolates were morphologically similar to D. sojae and D. curcurbitae. DNA was extracted from fungal hyphae and purified PCR products were sent to Eurofin, Inc. for sequencing. Sequencing analysis showed that some of the isolates were a match for D. pterocarpi and species within the D. arecae complex. Our findings of pathogenic Diaporthe spp. suggests that plant pathogens are carried across international borders and imported into the US. Further analysis is being conducted on melons collected in 2019 with multiple DNA primers to ensure accuracy.

3-Dimensional Design, Construction, and Testing of a Series of Feeding Apparatuses for Insect Feeding Behavior Research

Raistlin Hiner & Jimena Aracena

Abstract

Fruit flies (Drosophila melanogaster) are ideal models to test animal behavior in the laboratory. Particular foraging behavioral questions require construction of arenas and feeding equipment for testing at the appropriate scale for the small size of this animal (about 3mm). We used 3-D printing to construct very precise small feeding platforms (patches of food) with minute wells of particular shapes that contained set volumes of liquid food (usually sugar solutions). For this purpose, we used the graphic design program Tinkercad™to construct the patches from various geometric forms, including cubes, cylinders, and ellipsoids. The patches are constructed using a Dremel DigiLab 3D printer with ECO-ABS Filament material. Initial behavioral tests using the resulting food patches shows that the finishing quality, dimensions, and shapes constructed are ideal for behavioral testing and that the flies readily feed from the food in the wells inside the patches.

Infertility Treatment: Reality Versus Perception

Nathaniel Briggs

Abstract

The use of publicly-accessible data provides an opportunity to examine trends in infertility treatment. Assisted reproductive technology (ART) is used to treat infertility. In the US, fertility clinics report and verify numbers of ART cycles started and carried out in their clinics to the CDC. This data is accessible to the public in annual reports. 2016 CDC ART Surveillance report will be used to review the realities of fertility clinic accessibility and national success rates. We hypothesize that public-health campaigns regarding fertility treatment will increase Google search queries on the topic. Google trends was used to examine perceptions by comparing US searches for three terms (infertility, infertility awareness and male infertility) during the three years 2015-2017. These results show steady public queries as well as a regular increase in searches during an annual public-health campaign. Understanding the relationship between reality and perception regarding physical accessibility to fertility treatment, reported success rates, and search terms will be vital to addressing the public-health issue of infertility.

Infertility Treatment: Reality Versus Perception

Mona Easterling

Abstract

The use of publicly-accessible data provides an opportunity to examine trends in infertility treatment. Assisted reproductive technology (ART) is used to treat infertility. In the US, fertility clinics report and verify numbers of ART cycles started and carried out in their clinics to the CDC. This data is accessible to the public in annual reports. 2016 CDC ART Surveillance report will be used to review the realities of fertility clinic accessibility and national success rates. We hypothesize that public-health campaigns regarding fertility treatment will increase Google search queries on the topic. Google trends was used to examine perceptions by comparing US searches for three terms (infertility, infertility awareness and male infertility) during the three years 2015-2017. These results show steady public queries as well as a regular increase in searches during an annual public-health campaign. Understanding the relationship between reality and perception regarding physical accessibility to fertility treatment, reported success rates, and search terms will be vital to addressing the public-health issue of infertility.

Influence of Incubation Temperature on Antimicrobial Production by Isolated Soil Bacteria

Kadin Falkensten & Neil Enis

Abstract

New antibiotics are urgently needed to address the serious threat to global health posed by the emergence and proliferation of modern antibiotic-resistant pathogens in conjunction with declining rates of new antimicrobial drug discovery. Relatively simple protocols have been established to isolate and screen soil bacteria for potential antibiotic production and are being successfully employed in popular course-based undergraduate research curricula such as Small World Initiative (SWI) and Tiny Earth (TE). Because microbial metabolism and growth can be profoundly influenced by environmental conditions and current screening protocols sometimes specify incubation at a single predetermined temperature, we sought to evaluate the effect of varying incubation temperature on detectable antibiotic production by soil bacteria previously isolated by students in undergraduate Microbiology courses at Tulsa Community College utilizing SWI and TE curriculum. In this experiment, we determined the frequency at which soil isolates inhibited growth of nine test organisms when incubated at room temperature, 30oC, and 37oC. Cells of the test organisms were spread to form bacterial lawns on LB (lysogeny broth, aka Luria-Bertani) agar plates; sterile paper disks inoculated with soil isolates were subsequently added to the surface of each plate. After approximately 24 hours incubation at the three test temperatures, soil isolates were evaluated for potential antibiotic production as evidenced by zon

Isolation, Purification, and Characterization of a New Arthrobacteriophage Rizwana from Compost Soil.

Umar Sahi

Abstract

Bacteriophages are obligate, intracellular viruses that infect bacteria by utilizing ligands specific to bacterial receptors. Arthrobacter sp is a bacterium found in the Actinobacteria phylum and the genus Arthrobacter. Arthrobacter sp. are Gram-positive bacteria that have a rod morphology during exponential growth and cocci during the stationary phase. Due to their rapid growth and well-defined life cycle, Arthrobacter sp. are used in industrial and laboratory settings. Few arthrobacteriophages have been discovered and characterized, and there is still a need to find more. This research seeks to isolate novel arthrobacteriophages found in Oklahoma soil that infect host bacteria Arthrobacter sp. KY3901. Phage isolation was done by collecting soil from the Norman compost facility in Norman, OK. (35.174053 N, 97.444489 W). Phage was isolated through direct isolation method. Three plaque purifications were done through picking a single plaque and diluting the plaque in phage buffer. High-titer lysate was obtained and the phage genome was extracted using PCI method. The bacteriophage was named Rizwana. The phage forms clear, pinhead shaped plaques on the host bacterial lawn. Rizwana phage has a siphoviridae morphotype. The phage was sequenced and found to be a lytic DNA virus. The GC content of the phage is 63.6% with a total genomic length of 65,823 bp.

Testing the Infectivity of Arthrobacteriophages Isolated from Oklahoma Soil

Peace Chinedu

Abstract

Arthrobacter sp. belong to the phylum Actinobacteria. They are Gram-positive coryneform bacteria with a non-fermentative metabolism. They are mostly found in the environment (soil, water, plants, sewage etc.). However, three Arthrobacter species namely Arthrobacter cumminsii, Arthrobacter woluwensis, and Arthrobacter Albus have been isolated from humans. For this project, we wanted to test the host range of six arthrobacteriophages we isolated using host bacteria Arthrobacter sp. KY3901. We hypothesize that our phages have a very narrow host range and will not be able to infect the human isolate of A.albus.

Segregation in Little Rock Public Schools: A 20 Year Analysis

Cherokee Anderson & Liz Lane-Harvard, Ph.D.

Abstract

During the late 1950's, Little Rock, Arkansas's Central High School played a pivotal role in the history of desegregation in United States public schools. In recent years, however, court mandated desegregation measures have started to expire, leading to demographic shifts in the Little Rock Public School District. In this poster, we analyze racial trends in the district over the past 20 years. This is done by using a combination of ecological diversity measures and geospatial analysis. Geospatial analysis is used to compare current attendance zones and Voronoi attendance zones.

Comparison of suicide death rates between Native Americans and total population in the state of Oklahoma

Leslie Moore, Rylee Dunlap, & Ning Wu

Abstract

The suicide rates in Native American population have been known to be higher than that of US total population national wide. However, this trend may not apply to all the states. This study focuses on exploring the different suicide rates over the total death between American Indian (AI) and total population in Oklahoma. Numbers of suicide and total death were retrieved from CDC, US Census Bureau, and OK2Share databases from 2006 to 2015. The percent of suicides contributed by AI to the total suicide of Oklahoma was 96-134% comparing to that of the whole country 169-193%. The rate of suicide per total death showed that the highest suicide rates occurred in the 20-24 age group for AI and 45-49 age group for OK total population. The top three age groups for AI suicide in OK were (1) 20-24, (2) 35-39, (3) 25-29 and (1) 45-49, (2) 50-54, (3) 40-44 for OK total population. Comparison studies to the suicide rate of AI and US total population national wide showed that the highest suicide rates occurred in the 15-19 age group for both AI and US total population. The top three age groups for AI were (1) 15-19, (2) 20-24 and 10-14. The top three age group for US total population were (1) 15-19, (2) 20-24, (3) 10-14. The results demonstrated that Oklahoma state has lower AI suicide rate than that of national wide AI population. In addition, the top three suicide rate age groups in OK are older than national AI and total population. Further studies will focus on the social, economic, and

Winter Ecology of Mediterranean Geckos (Hemidactylus turcicus) at the University of Central Oklahoma

Madison Birdwell, Mari Nguyen, & Allyson Fenwick

Abstract

The Mediterranean gecko (Hemidactylus turcicus) is an exotic and nocturnal species. As an ectotherm, it is strongly influenced by environmental temperatures. Central Oklahoma is near the northern end of the species' range estimated by environmental range mapping. Previous work in introductory biology courses found geckos active in January. Our objective was to characterize gecko density year-round, including temperatures of observed geckos and ambient temperatures when observed. We chose the original introduction site of Howell Hall and a more distant building, Communications. The buildings are surveyed once per week, year round. For each gecko observed we measure the temperature of the individual plus other wall sites. We also measure ambient temperature, light and other factors. We found that the density decreases in the colder months, but does not disappear completely as expected from a reptilian species. These geckos have been found at temperatures below their critical thermal minimum of 10 C. Preliminary analysis finds that geckos are not choosing sheltered spots compared to other areas they could have chosen. Geckos are slightly warmer than ambient temperature but the magnitude of difference may not be biologically relevant. The conclusion that individuals are choosing locations on the buildings that are the same as others leads observers to support laboratory conclusions that H. turcicus is a poor thermoregulator.

Foraging behavior of fruit flies (Drosophila melanogaster) on patches of sugar: the effects of distance and food quality

Caden Bowles & Jimena Aracena

Abstract

Animals use searching mechanisms that maximize energy while foraging on patches, which are food sources arranged in groups. Fruit flies (Drosophila melanogaster) are ideal models to test animal behavior in the laboratory. We can manipulate food quality, volume, and distribution. In this experiment, we intended to test the effect of food concentration and distance between patches of food on their foraging behavior. We placed two patches (6.8cm^2) of sucrose solutions (one with red 0.25 M and one with blue 0.125 M sucrose) at five distances from each other (0, 0.5, 1, 2, and 4 patch spaces). We allowed 100 flies to feed in the dark and scored them according to their abdomen color. We predicted that as distance decreases, the flies will be able to select the higher concentration (better) patch. Flies can walk on vertical surfaces and fly between patches of food. Therefore, we also propose to test their foraging behavior and orientation on 3-D cubic and spherical patches, which we are designing with Tinkercad™and a Dremel DigiLab 3D printer with ECO-ABS Filament material.

Expression Patterns of Murine Phenylalanine Hydroxylase Using Reverse Transcription Polymerase Chain Reaction

Cassandra Ortiz

Abstract

Reverse transcription polymerase chain reaction (RT-PCR) is currently the most viable option for quantifying gene expression. This ability to detect and quantify low levels of messenger RNA is used in molecular medicine, forensics, virology, and microbiology. Fluorescent, real-time, RT-PCR quantifies the target gene copy number against a normalized, house-keeping gene by using a statistical threshold of fluorescence called the cycle threshold (CT). Through a two- enzyme/one-tube reaction, the risk of contamination is reduced. An initial reverse transcription of the messenger RNA into complimentary double stranded DNA is necessary before polymerase chain reaction can begin. Phenylalanine hydroxylase deficiency results in intolerance to dietary intake of the essential amino acid phenylalanine with severe deficiencies resulting in phenylketonuria. The first aim of the investigation included the comparison of phenylalanine hydroxylase (PAH) transcription in mice using heart and liver messenger RNA with r18S as a normalizer. The second aim of the investigation included a study of the introduction to the technique in the first two years of postsecondary study. The hypothesis was that PAH expression is greater in liver vs. heart tissue. Methods included reverse transcription and PCR enzymes with primers, buffers and dNTPs in the BioRad iQ5 iCycler using SYBR Green. Liver cells produce more PAH than heart cells. The fold difference was 891.4 in liver cells as compared to heart cells.

In Vitro Evaluation of PEGDA-PCL Laser Scaffold

Sannam Salarvandi

Abstract

Polyethylene Glycol Diacrylate (PEGDA) tissue scaffolds were shown to have limited applications in tissue engineering due to the inability of cells to adhere and migrate within the scaffold. Our lab has developed a PEGDA-based composite scaffold with microscopic holes that are created using a laser machine, while wrapping the scaffold with poly-e- caprolactone nanofibers. This study examined the physical, mechanical, and biological properties of PEGDA-PCL and PEGDA - PCL-Laser scaffolds to determine the effect of the laser holes on PEGDA. Our goal is to determine whether the lasered PEGDA - PCL scaffold absorbs nutrients with time and can provide an ideal environment for the survival of cells. Furthermore, cell viability tests indicate that the cell adhered, proliferated, and migrated in the PEGDA-PCL- Laser scaffold. This novel PCL-PEGDA would provide an environment required for enhancing tissue integration with native tissue that produces better clinical outcomes for cartilage repair or regeneration.

Plant-Pollinator Network of a Gypsum Outcrop Community in the Cimarron Gypsum Hills of Northwestern Oklahoma

Gloria Caddell & Gabriel Rucci

Abstract

A pollination network is a compilation of plants and their flower-visiting animals, and is focused on community level interactions. This study will describe and analyze the pollination network of the native plant community on gypsum outcrops at the Selman Living Lab in the Cimarron Gypsum Hills of northwestern Oklahoma. On 31 days throughout the growing seasons of 2018 & 2019, insect visitors to flowers of all flowering plants on two gypsum outcrops were recorded in the early morning, early afternoon, and late afternoon. Visits by 86 species of insects were recorded to 25 plant species. Connectance, the percentage of all possible interactions that occurred, was 13%. Linkage, the mean number of taxa with which plants or pollinators interact, was 11 for plants and 3 for insects. Insects were categorized into functional groups, and the richest group was beetles. The usefulness of the pollination syndrome concept in predicting the pollinators of plants in this community will be evaluated. Further analysis will provide information on temporal differences in connectance and linkage throughout the day, throughout the growing season, and between years. Results will be compared to networks from grassland communities at similar latitudes, and in various other habitats.

Differences in Coding Sequence Between Bats and Humans in the Tumor Suppressor Gene PTEN

Madelyn Goodman

Abstract

As the average human lifespan increases, so does the risk of developing age-related diseases. Cancer is among the most common of these diseases and is a leading cause of death. Therefore it is imperative to advance methods of prevention and treatment for age-related diseases. Despite the correlation between cancer incidence and age in humans, bats are the longest living mammal of their size and rarely develop cancer. Our study aims to examine the differences in the coding sequence of the tumor suppressor gene PTEN in humans and bats. The PTEN (phosphatase and tensin homolog) protein inhibits cellular proliferation, survival, and motility. The normal function of the PTEN protein is commonly lost in human cancers and its deregulation causes implications in many other diseases. The PTEN gene is also found in bats and differences in coding sequence or regulation could possibly explain their resistance to cancer. We took wing punch samples from two species of bats (Myotis velifer and Tadarida brasiliensis) and separated the RNA. Then we converted the RNA into cDNA and isolated the PTEN gene using PCR and gel electrophoresis. A comparison of 350 base pairs of the coding sequence revealed 11 base changes and only one amino acid change unique to humans. These are preliminary results and interestingly PCR amplified multiple fragments, which may indicate alternative splicing is occurring in these bats.

Type I IFN Production by Bone Marrow Dendritic Cells induced by GC in Laser Immunotherapy

Sara Zukerman

Abstract

N-dihydrogalactochitosan (GC) is a novel immunostimulant that has been used to treat metastatic cancers in tandem with photothermal therapy (PTT). PTT+GC, also termed laser immunotherapy (LIT), has shown promise in pre-clinical and preliminary clinical studies. However, the mechanism of LIT is not clear, particularly how GC interacts with the immune system and, more specifically, dendritic cells in order to produce the desired immunostimulatory effect. It is believed that GC activates dendritic cells to produce type I interferons (IFNs). Understanding these interactions will provide invaluable insight as to how GC is able to induce an antitumor immune response. This study is to investigate both the effect of type I IFN on the activation of DCs by GC, but also on the antitumor immune responses induced by LIT.

Bioinformatics Investigating Parkinson's Disease

MacKenzie Mims

Abstract

Parkinson's Disease is a hereditary disease that affects approximately 60,000 people in America today. It affects the substantia nigra in the human brain which leads to trimmers, slowness in movement, loss of sense of smelling and difficulty in maintaining balance. The disease is far more complex than one would think due to the severe damage that is done to the brain causing the loss of production of the important neurotransmitter dopamine. We utilized bioinformatics, which is the science of gathering and analyzing intricate biological data. The mutated gene, DJ-1, is on the chromosome number 1. We investigated the mutated gene implicated in susceptibility to Parkinson's Disease. There is no cure for the disease. The CT scans revealed absent dopamine neurons. We concluded that there is degeneration of dopaminergic neurons in the pars compacta of the substantia nigra.

Potential Distribution of the Biocontrol Agent Toxorhynchites rutilus by 2070

Daniel Marshall & Chris Butler

Abstract

Climate change projections indicate that mosquito distributions will expand to include new areas of North America increasing human exposure to mosquito-borne disease. Controlling these vectors is imperative, as mosquito-borne disease incidence will rise in response to expansion of mosquito range and increased seasonality. One means of mosquito control used in the United States is the biocontrol agent, Toxorhynchites rutilus. Climate change will open new habitats for its use by vector control organizations, but the extent of this change in habitat is currently unknown. We used a maximum entropy approach to create species distribution models for Tx. rutilus under four climate change scenarios by 2070. Mean temperature of warmest quarter (22.6°C to 29.1°C), annual precipitation (1025.15 mm to 1529.40 mm), and precipitation seasonality (≤17.86) are the most important bioclimatic variables for suitable habitat. The centroid of current possible habitat distribution of Tx. rutilus is in central Tennessee. Depending upon the scenario, we expect centroids to shift north-northeast by 97.68 to 280.16 km by 2070. The extreme change in area of greater than 50% suitable habitat probability is 141.14% with 99.44% area retained. Our models indicate limited change in current habitats as well as creation of new habitats. These results are promising for North American mosquito control programs for the continued and potential combat of vector mosquitoes using Tx. rutilus.

Survivorship of Aedes aegypti and Culex quinquefasciatus in the Presence of a Natural Enemy

Daniel Marshall

Abstract

Larvae of the predatory Toxorhynchites mosquitoes feed on aquatic invertebrates including other mosquitoes. Adults feed on nectar, never blood and are thus incapable of transmitting human or animal pathogens. Due to their unique feeding behaviors and ability to target larval mosquito habitats, Toxorhynchites spp. are used as natural enemies by mosquito control professionals. In the United States Toxorhynchites rutilus is used across much of the Gulf Coast where it reduces populations of Aedes aegypti and Culex quinquefasciatus. The extent of predatory control Tx. rutilus exerts on these vectors is currently unclear. Here we observed survivorship of Ae. aegypti and Cx. quinquefasciatus in the presence of Tx. rutilus to determine the efficacy of the predator and infer a prey preference. To measure survivorship, we exposed prey to a single predator for 12 hours. During this time we observed mortality and time of attack. We report 43.5% reduction in Ae. aegypti (N=390) and 45.7% reduction in Cx. quinquefasciatus (N=350). Cumulative survivorship probability at 12 hours for Ae. aegypti is 0.43 and 0.46 for Cx. quinquefasciatus. Our results indicate no significant difference in survivorship or predation rate between prey species. Mosquito control professionals should be aware that Tx. rutilus does not display a preference between Ae. aegypti and Cx. quinquefasciatus. Releasing the predator into habitats with both species will result in approximately equal control.

Rac and Rho Regulation of Compaction and Contraction in Collagen Matrices Visualized With Optical Coherence Tomography

Natthapume Attamakulsri, Gang Xu, & Mel Vaughan

Abstract

Dupuytren's contracture (DC) is a condition where connective fibrous tissue continuously grows on the palm of the hand and attaches to the tendon sheaths, resulting in a scar-like deformity. The cell believed to be responsible for DC is the myofibroblast. Myofibroblasts, when placed within an anchored collagen matrix create migration and contraction properties, similar to what is seen in DC. Migration is focused on lamellopodia movement, while contraction focuses on stress fibers. Both properties are regulated by small G-proteins labeled Rac and Rho, respectively. We focused on the study of Rac and Rho regulation on myofibroblast compaction and contraction in collagen matrices in vitro. We asked whether Rac and Rho regulation would affect anchored collagen tension. The methods involved culturing anchored collagen cell matrices for 3 days to allow for tension generation. We added Rac and Rho inhibitors, waited one hour to allow for maximum inhibitory effects, and measured matrix height utilizing optical coherence tomography (OCT). OCT was used to monitor collagen tension development under anchored conditions. Our results show inhibition of Rho and Rac reduced compaction; however, Rho inhibition was more effective, suggesting the stress fiber organization of actin was more important to compaction than the migration-related actin organization.

Treatment of pyelonephritis using drug-encapsulated liposomes

Alejandro Torres

Abstract

Urinary tract infections (UTIs) affect millions of men, women and children. Majority of UTIs are caused by uropathogenic Escherichia coli (UPEC). Some invasive UPEC can evade immune surveillance and effects of antibiotics by invading between the tissues and internalizing into the host epithelial cells. These UPEC can also ascend the urinary tract and colonize kidneys, resulting in pyelonephritis. If left untreated, pyelonephritis can progress to organ failure, sepsis, and death. Due to the increase in antimicrobial resistance and invasiveness of UPEC strains, innovative alternatives to antibiotics are essential to effectively treat UPEC. In the current study, we hypothesize that using biocompatible drug-encapsulated liposomes as therapeutic agents can effectively aid in treating pyelonephritis caused by intracellular uropathogens. To test this hypothesis, our model comprised of an invasive strain of E.coli that was used to infect the human kidney HK-2 cell line. Our preliminary results show that ciprofloxacin-encapsulated liposomes did not induce cytotoxicity or affect cell viability at the tested concentrations. We were also able to determine that liposomes can interact with the HK-2 cells through flow cytometric analyses. These findings suggest that liposomes are promising candidates that can be used therapeutically in kidney cells and more investigations are needed to determine if they can be used to treat pyelonephritis.

Investigating the use potential use of reduced graphene oxide-low-density lipoproteins (rGO-LDL) in laser immunotherapy for cancer treatment

Kyra Gallagher & Sara Zukerman

Abstract

This study focuses on the possibility of using a nanoparticle synthesized of reduced graphene oxide (rGO) and low-density lipoproteins (LDL), which has been dubbed rGO-LDL in conjunction with laser immunotherapy (LIT) cancer treatment. RGO-LDL was synthesized with the idea that, since cancer cells tend to uptake LDL and deplete healthy cells of it, and since graphene derivatives like rGO have been documented to have excitation wavelengths in the near-infrared (NIR) range that many light-based therapies operate in and to interrupt the production of a cytoskeletal structure, their combination could theoretically aide in cancer therapy. Previously, much characterization of the nanoparticle has been done. This study builds upon what is known of rGO-LDL and, further, deduces its potential applications in cancer treatment, specifically under laser irradiation. The surface features of rGO-LDL are observed via scanning electron microscopy (SEM). In investigating rGO-LDL's interaction in cell culture, the inherent toxicity was tested in the 4T1 cell line. The cytotoxicity of rGO-LDL is tested with a gradient of concentrations via incubation with tumor cells. The results of this study will be valuable to guide the use of rGO-LDL for cancer treatment using photo-immunotherapy.

Antibacterial Activity of Extracts of Brassica oleracea var. botrytis and Brassica oleracea var. capitata.

Matthew Clark & KJ Abraham

Abstract

Matthew Clark and Kj. Abraham Department of Biology, Langston University, Langston, OK.

Natural chemicals from plants are medicinally important and are a good source of new antibiotics to combat microbes that have developed resistance to some of the currently used antibiotics. The objective of the experiment is to test for antibacterial activity in Brassica oleracea var. botrytis and Brassica oleracea var. capitata. The hypothesis is that both B. oleracea var. botrytis and B. oleracea var. capitata will both show antibacterial properties. The stems of B. oleracea var. botrytis and B. oleracea var. capitata were oven dried, powdered, and extracted using a Soxhlet Apparatus with methanol. Different concentrations of methanol and water fractions were tested on Bacillus brevis for antibacterial activity. Methanol fractions inhibited bacterial growth in 48 hours while water fractions showed no effects. Extracts from red cabbage indicated no antibacterial activity. Methanol extracts shows promise and potential for use as natural plant antibiotics in medicine in the future.

Molecular mechanisms of teratogenicity of Phenylalanine in MPKU

Kayley Pate

Abstract

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]. However, the mechanisms responsible for Phe-induced CVMs are poorly understood. In this study, we aim to determine the effect of Phe on the transcriptome and development of an avian model of MPKU. Preliminary data determined two pathways, Retinoid (RA) and Focal Adhesion (FA), were significantly enriched. In review of the literature RA signaling is important in heart development and increases or decreases in levels of RA can cause significant developmental defects. Additionally, FA signaling effects cell behaviors including cell motility, proliferation, and survival. Methods: RNA-Seq-Fertilized chicken eggs were treated with 2500uM PHE through yolk injection at HH6. Embryos were incubated until HH14 and then dissected. The head/cranial region and the thoracic/cardiac region were dissected. For the control group, 3 embryos were pooled and 2 embryos were used for treated for a total of 3 samples. RNA was isolated and shipped to Applied Biological Materials for enrichment for mRNA, library construction, and sequencing on the Illumina NextSeq500. Data was analyzed with the open source software Galaxy Suite. QPCR was conducted on staged matched embryos for genes in heart development and the Retinoid Pathway (RA), and Hepatocyte.

Contamination or Community? Testing for Bacterial Provenance in Monoculture Diatom Sequencing Data

Gary Thomas

Abstract

Diatoms are single celled organisms with a silicized shell, found in nearly all bodies of water on the earth. Diatoms account for 20% of global photosynthesis, are highly diverse, and account for a vital carbon source at the base of marine food chains. Diatoms take part in critical cross-domain relationships with bacterial species, involving exchange of B vitamins, organic carbon, iron, phosphorous, and nitrogen. We sequenced five diatom monocultures and recovered diverse microbial communities, including four complete bacterial genomes residing in a monoculture of the diatom Psammoneis japonica. We tested for the presence of these bacteria in remaining diatom cultures, to determine whether their presence was due to cross-sample contamination or if they were natively associated with Psammoneis. We first filtered sequencing data using the program Trimmomatic. We then assembled the data using Ray assembler, which allows assembly from large and complex metagenomic datasets. Finally, we used TAGC Plots and BLASTn with a custom database to test for presence of bacteria in diatom cultures. We found very limited evidence of presence of only a single identified bacterial species in one non-Psammoneis culture, supporting that at least three of four bacterial species in Psammoneis culture are natively present with this diatom species, and are not due to laboratory cross-contamination.

Contamination or Community? Testing for Bacterial Provenance in Monoculture Diatom Sequencing Data

Dr. Matthew Parks

Abstract

Diatoms are single celled organisms with a silicized shell, found in nearly all bodies of water on the earth. Diatoms account for 20% of global photosynthesis, are highly diverse, and account for a vital carbon source at the base of marine food chains. Diatoms take part in critical cross-domain relationships with bacterial species, involving exchange of B vitamins, organic carbon, iron, phosphorous, and nitrogen. We sequenced five diatom monocultures and recovered diverse microbial communities, including four complete bacterial genomes residing in a monoculture of the diatom Psammoneis japonica. We tested for the presence of these bacteria in remaining diatom cultures, to determine whether their presence was due to cross-sample contamination or if they were natively associated with Psammoneis. We first filtered sequencing data using the program Trimmomatic. We then assembled the data using Ray assembler, which allows assembly from large and complex metagenomic datasets. Finally, we used TAGC Plots and BLASTn with a custom database to test for presence of bacteria in diatom cultures. We found very limited evidence of presence of only a single identified bacterial species in one non-Psammoneis culture, supporting that at least three of four bacterial species in Psammoneis culture are natively present with this diatom species, and are not due to laboratory cross-contamination.

Pulmonary Dendritic Cell Subset Interactions with Cryptococcus neoformans

Brenden Determann II

Abstract

Cryptococcus neoformans is an opportunistic fungal pathogen acquired by inhalation that causes cryptococcal meningitis. This disease results in over 180,000 annual deaths in patients with AIDS. Innate phagocytes in the lung can kill C. neoformans, or it can evade killing and replicate intracellularly. Intracellular survival is thought to be responsible for dissemination of C. neoformans from the lung to the brain, causing meningitis. Dendritic cells (DCs) are innate phagocytes that can kill C. neoformans in vitro, and these cells are recruited to the lungs during cryptococcal infection. Two subsets of conventional DCs are described in the murine lung: CD11b+ and CD103+. Based on our data with other innate phagocytes, we hypothesized that pulmonary DC subsets have different interactions with C. neoformans. We first purified DC subsets from murine lungs and analyzed DC-cryptococcal interaction. Flow cytometry confirmed interaction of each DC subset with C. neoformans. Antifungal assays showed that neither DC subset has antifungal activity in vitro. Further studies will examine cytokines produced by the DC subsets and intracellular morphology following uptake of C. neoformans by each DC subset. Also, RNA sequencing will be used to identify genes that are up- or down-regulated in DC subsets following cryptococcal interaction. Understanding mechanisms of DC antifungal activity or fungal immune evasion will provide new therapeutic targets for cryptococcal meningitis.

Modeling the Projected Changes in Distribution of Five Palm Species as a Direct Effect of Changes in their Climate Suitability

Matthew Larson

Abstract

Palms have been used as historical data to indicate an environment's climate in the past. Palms today are expected to be impacted by climate change and few studies have shown how palm trees distribution might shift under different climate scenarios. In this study we used a maximum entropy approach to model the predicted distribution of five species of palm Sabal minor, Sabal etonia, Sabal palmetto, Rhapidophyllum hystrix, and Serenoa repens under different climate change scenarios. We collected occurrence records for all five of the palm species from the Global Biodiversity Information Facility, New York and Cornell botanical gardens, and Texas herbaria. Using the collected occurrence records, we created a Maxent model for each of the five species by applying 19 different bioclimatic variables at a resolution of 2.5 arc minutes and 11 different general circulation models. Our resulting projected species distributions yielded interesting responses. Many models like Sabal minor show a strikingly significant decrease in suitable habitat and a substantial movement northward. Other models like Rhapidophyllum hystrix showed little to no change in suitable habitat and distribution.

Natural Explosives: Researching the Native Vine Cyclanthera Dissecta, or Squirting Cucumber, for ten Years.

Courtney Johnson & Lisa Castle

Abstract

Students at Southwestern Oklahoma State University have been given the opportunity to engage in fieldwork and data manipulation while working with Cyclanthera dissecta, a weedy annual vine that is native to Oklahoma. Despite being related being related to known medicinal and edible plants (e.g. Cyclanthera pedata), little is known about this plant with exploding seed pods. The interesting physical characteristics and lack of extensive previous research have made this plant good for student research. Data collection has focused primarily on population size (ranging from 14 to almost 3000 plants in one population) and location of individuals. Students have analyzed the correlation between drought and population decline and are investigating influences of other factors including the timing of first freeze and seed germination on population size.

Behavioral Responses of Adult and Neonate Sceloporus consobrinus Lizards to Predatory Odors

Rance Kingfisher & Mark Paulissen

Abstract

Sceloporus lizards are known for their ability to detect conspecific odors; this study will determine whether they can also use their chemosensory abilities to detect the odors of one of their predators: Masticophis flagellum (Coachwhip snake). Behaviors such as tongue flicks, cage dancing, tail wiggling, and substrate touches to predatory snake odors left on sheets of filter paper were recorded and compared to behaviors lizards showed to a series of control odors (water, pungent odor, and non-predatory snake odor). The experiment also looked for differences in behavioral reactions to predator odors between adult and neonate lizards. I recorded number of tongue flicks, substrate touches, glass jumps, tail wiggles, time spent cage dancing, time spent in retreat, and amount of time spent on filter paper for all four odor treatments. There were no significant differences in the number of times these behaviors were performed by lizards among the trials. However, adult lizards showed a significantly greater number of odor detection behaviors (tongue flicks and substrate touches) compared to neonates. This study showed that there is no evidence that Sceloporus can distinguish the odors of the predatory snake M. flagellum from other snakes or water, or if it can, there is no evidence that the lizards reacted differently to these odors versus controls. This study also shows that adult lizards can potentially learn to be vigilant to unknown chemical cues as they grow older.

Phenotypical Analysis of Old and Young Dupuytren's Disease Cells

Gang Xu, Mel Vaughan, & Austin Segrest

Abstract

Dupuytren's Contracture (DC), a buildup of scar tissue in the hand causing digits to flex is treated with surgical removal or enzymes. Contractures have high recurrence rates. Evidence suggests recurrent nodule cells proliferate slower than primary nodule cells; additionally, fibrotic conditions appear to have telomere dysfunction; therefore, short telomeres may play a role in pathologies of recurrent DC. Telomeres shorten when primary cells are cultured. Phenotypic differences of DC cells aged in vitro could be used as a comparison for future in vivo studies. Cells of different population doublings (PD) from a single DC patient (Early/Late PD) were thawed and cultured using standard culture conditions. A scratch wound migration assay was conducted with varying concentrations of platelet derived growth factor (PDGF). A vinculin stain was done to test whether focal adhesion size in presence/absence of TGF-β;, contributed to in vitro aging phenotype. Both Early/Late PD cell cultures had PDGF dose-dependent increase in migration. Late PD cells showed lower migration. Early PD cells had more super mature focal adhesions in control conditions than TGF-β; conditions. Late PD cells had more super mature focal adhesions in TGF-β; conditions than control conditions. In vitro aging indicated changes from migratory to stationary. Research with other patients' in vitro aged DC cells is ongoing. These studies may provide insights into effects telomere shortening.

Analysis of Proliferation in Phenylalanine, Retinoic Acid, and RA-Inhibitor Treated Cells

Nazka Nurbyek & Michaela Vance

Abstract

Maternal phenylketonuria [MPKU] is a syndrome of multiple congenital anomalies including cardiovascular malformations [CVMs], and growth restriction when a mother with Phenylketonuria [PKU] does not control her intake of Phenylalanine [Phe]. However, the mechanisms responsible for Phe-induced CVMs are poorly understood. Our lab has evidence that high levels of Phe could inhibit Retinoic Acid [RA] signaling, which typically promotes the expression of genes controlling 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 proliferation, which may contribute to the defects seen in MPKU. We also looked at the effects of exposure to RA and a RA inhibitor. We conducted proliferation assays on several cell types including primary cells, and mouse neural crest cells o9-1, to determine the effect of Phe, RA, and a RA inhibitor exposure on proliferation. Images were analyzed with ImageJ and GraphPad Prism. Present research suggests that Phe exposure causes a significant decrease in proliferation of cells. It has been shown that RA increases proliferation, and that RA inhibition decreases proliferation. This could contribute to the CVMs observed in MPKU. This work is significant because it eludes to a potential mechanism that Phe could affect RA signaling, thus resulting in the types of defects observed in human MPKU.

When the Hotline Bling: Angler Choice in Reporting Methods of Tagged Fish

Alexis Peeper & Dr. Andrew Taylor

Abstract

Modern fisheries management is aimed at maximizing human benefit and enjoyment of natural resources, while also working to conserve these resources for future generations. Biologists often tag fish in the wild and rely on angler reports of these tags to glean useful information about migratory behaviors, growth patterns, and fishing pressure. Our objective was to evaluate angler choice among three tag reporting methods and how data quality varied across reporting methods. We tagged 949 black bass (Micropterus spp.) in three tributary streams of Lake Tenkiller, Oklahoma, in April and May of 2019. Anglers were presented with three different ways to report: telephone number, email address, and/or uploading records to an iNaturalist project. We explored what methods anglers chose when reporting tagged fish, as well as how data quality varied across reporting methods. For example, we compared how many reports contained an appropriate tag number, the quality of the locality description, and whether or not photographs were included in the report. Results gleaned from this study can be leveraged to increase tag reporting rates and the quality of data resulting from angler reports, advancing fisheries management and conservation efforts.

Nanodiamonds - A Novel Therapy for the Treatment of Pyelonephritis

Mackenzie Bonnewitz

Abstract

Pathogenic microbes are becoming increasingly invasive and resistant to antimicrobials. This is true for strains of Escherichia coli (E. coli) that are opportunistic pathogens. E. coli is the causative agent of more than 85% of urinary tract infections (UTIs). UTIs resulting from invasive E. coli strains are often difficult to treat due to recurring infections and increasing rates of antibiotic resistance. Invasive E. coli can also ascend to the kidneys from the bladder, resulting in kidney infections called pyelonephritis. Pyelonephritis is more difficult to treat thereby increasing the cost and time of treatment. Thus, it is vital to find novel treatments that can be effective against invasive uropathogens. Nanodiamonds (NDs) are potential candidates that can deliver drugs, like antimicrobials, intracellularly. Due to their small size, biocompatibility, and ability to attach various molecules to their surface, NDs are promising therapeutic agents. In the current study, we determined if NDs can interact with kidney cells by using the human kidney cell line, HK-2, as a model. Cell viability and ability of NDs to bind to HK-2 cells was determined after treating the cells with NDs. Our results indicated that NDs were not cytotoxic to HK-2 cells up to a concentration of 200 μg/mL, when incubated for 6 hours. We were also able to detect dose-dependent binding of NDs to HK-2 cells. These findings suggest that NDs may be suitable to deliver drugs intracellularly to kidney cell

From a Cellular Perspective: Can Glycated Chitosan, an Immunoadjuvant, Limit the Deposition of Scar Tissue?

Gang Xu, Mel Vaughan, Khue Tu Doan, & Natthapume Attamakulsri

Abstract

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. This experiment aims to determine the specific mechanism of GC on myofibroblast phenotypes and the reorganization of collagen matrices via the scanning electron microscope (SEM). 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. Results from immunofluorescent staining showed GC did not inhibit the presence of proliferative myofibroblasts. Therefore, using SEM, different extracellular matrix molecules are investigated as possible mechanisms that affect compaction and contraction in GC-incorporated lattices. This suggests GC may be a potential treatment for the recurrent problem of fibrotic diseases by inhibiting fibroblast compaction and contraction.

Effects of Antimicrobial Compounds in Spinacia oleracea

Yeremuh Rodaind and KJ Abraham, Department of Biology, Langston University, Langston, OK.

Rodaind Yeremuh

Abstract

An antimicrobial compound is an agent that kills microorganisms or inhibits their growth. Studies have shown that some vegetables such as Spinacia oleracea (spinach) and lactuva sativa (lettuce) consumed by humans contain antimicrobial properties. Recent studies have shown the presence of some phenolic compounds as antimicrobial agents in S. oleracea. The objective of this research work was to determine the effects of compounds from spinach leaf extracts on Escherichia coli. My hypothesis is that, spinach leaves will show the presence of new compounds with antimicrobial properties. Fresh leaves of spinach were dried and extracted with methanol using the Soxhlet apparatus for approximately 24 hours. Different concentrations of methanol and water fractions were tested for antibacterial activity on E. coli. Both fractions indicated the presence of antimicrobial compounds, confirming the hypothesis. Further work is in progress to isolate and identify the compounds in both fractions and attempt to characterize new natural antibiotics.

Inhibition of Listeria spp and Salmonella spp on Sprouting Mung Bean Using a Cinnamon Oil Nanoemulsion

Hari Kotturi & Kanika Bhargava

Abstract

The objective of this study is to determine the efficacy of cinnamon oil nanoemulsion in inhibiting the growth of the foodborne pathogens Listeria and Salmonella on mung bean seeds throughout the sprouting process. We hypothesize that Cinnamon oil nanoemulsion will inhibit the growth of Listeria and Salmonella on mung beans, over the sprouting process, after treating seeds. A 5% cinnamon oil nanoemulsion (CONE) was prepared by 20-minute sonication of natural 100% cinnamon oil with the surfactant Tween 80 and DI water. Seeds were tested for germination following CONE treatment. To test treatment, the seeds were artificially inoculated with a three-strain cocktail of either L. monocytogenes or S. enterica then soaked in CONE for one minute. The mung bean seeds were watered and allowed to sprout over a 72 hour period. Samples of the sprouts were homogenized using a stomacher and bacterial enumeration was performed at 0, 24, 48, and 72 hours after treatment. Our results indicate that the CONE treated seeds showed a reduction in bacteria over the seeds treated with water control and no negative effect on germination. Following a 0.5% treatment, the seeds inoculated with S. enterica showed the most significant reduction immediately following treatment, at 0 hours, with a 0.89 log reduction. The inoculated with L. monocytogenes showed the greatest reduction after 24 hours, with a 1. 05 log reduction.

PRELIMINARY ASSESSMENT OF THE IMPACT OF VEGETATION AND CLIMATIC FACTORS ON SMALL MAMMAL COMMUNITIES AT SELMAN LIVING LAB

Taylor Gray

Abstract

The purpose of this project is to monitor changes in small mammal populations and communities over multiple generations to determine what factors affect how the populations and communities change over time. In March of 2018, a permanent trapping web was established at the University of Central Oklahoma's Selman Living Lab (SLL). Two additional permanent webs were established in June of 2018. The SLL is located in the gypsum hills of Woodward County in western Oklahoma. Surveys of the 3 webs are conducted for 3 nights, 4 times a year, and include collection of mammalian and vegetation data. Climate data also is obtained for each day of the trip; monthly and yearly climate data also will be assessed. To date, 7 mammalian and vegetation surveys have been conducted. Based on preliminary data, seasonal and habitat trends have been detected in mammalian populations, with the lowest capture numbers occurring in the summer and reaching peak numbers in the spring. The trapping web located on mixed, slightly disturbed habitat has the most diverse community and the most number of captures/recaptures. Preliminary vegetation data shows seasonal and yearly trends. In the future, the animal, climate, and vegetation data will be used to build mathematical models that can be used to determine which factors have the largest impact on population and community persistence. Additionally, changes in the genomic make-up of the populations over time will be assessed.

Development of Fundamental Laboratory Techniques in the Life Science Field

Elijah Woodward

Abstract

Efficient organization of research laboratories enables accurate and reproducible progress in discovery-based sciences. To support this goal, activities included correct construction and documentation of plasmid libraries (growth/purification and mapping), stocking buffers and pouring/running DNA agarose gels. Notebooking techniques involved electronic documentation of procedures and results analysis. For buffers, calculations, procedure, picture details and final storage labeling and location were documented. The normal progress through a scientific laboratory begins with acquiring these hands-on techniques while communication of techniques remain underdeveloped until later in the scientific training. The goal of the project is an overall hands-on laboratory experience with training in all aspects of the sciences

Sexual selection in a changing world: the effects of cultural eutrophication on the mating biology of amphipods

Parker Judkins

Abstract

Humans are altering ecosystems at alarming rates. Cultural eutrophication is increasing in nutrient loading of aquatic systems due to human activities (e.g., fertilizer runoff). We will explore the population-level consequences of how cultural eutrophication affects sexual selection- an evolutionary process that shapes mating characteristics (e.g., deer antlers). We collected freshwater amphipods, small crustaceans, from nine lakes in NW Pennsylvania that vary in total phosphorus. We used a dissecting microscope fitted with a camera to image due to varying sizes of sexual traits caused by human interactions, of a species of amphipod native to NW Pennsylvanian lakes. Sexual traits differ across lakes due to differences in nutrient availability linked to human interactions, possibly caused by fertilizer or pesticide runoff. We collectedspecimens and measured sexually selected traits- gnathopods and antennae. Mating pairs of amphipods from 9 Pennsylvania lakes, then dissected and took pictures of the specimens. The pictures were of the whole body, head, gnathopods, and antennae. We found that the gnathopods were larger regardless of the size of the male and were less variable among males in lakes with a higher concentrations of phosphorus. Our results showed that human-driven pollution of aquatic systems interactions may weaken the value of sexually selected trait. Leading to the inhibition of accurate sexual selection.

Association of Conflicts of Interest of Public Speakers at Meetings of the Dermatologic and Ophthalmic Drug Advisory Committee and the Ophthalmic Devices Panel of the US Food and Drug Administration

Matt Vassar & Mostafa Khattab

Abstract

The U.S. Food and Drug Administration holds meetings with advisory committees to discuss the approval of devices and drugs. It has recently been called into question whether conflicts of interest may sway a speaker's argument toward approval of a drug or device. Our study investigated the financial conflicts of interest of open public hearing speakers at meetings of the Dermatologic and Ophthalmic Drug Advisory Committee and the Ophthalmic Devices Panel. We searched the transcripts of FDA meetings from February 2009 to October 2017 and identified speaker names, if they were affected by the disease for which the drug or device is indicated, if they were treated with the product, whether the speaker reported any COI, and if the speaker's statement regarding the product was positive, negative, or neutral toward marketing approval. Our results showed that, compared to speakers without a COI, speakers with a COI were significantly more likely to speak positively about the drug/device in question.

Association of Conflicts of Interest of Public Speakers at Meetings of the Dermatologic and Ophthalmic Drug Advisory Committee and the Ophthalmic Devices Panel of the US Food and Drug Administration

Courtney Cook

Abstract

The U.S. Food and Drug Administration holds meetings with advisory committees to discuss the approval of devices and drugs. It has recently been called into question whether conflicts of interest may sway a speaker's argument toward approval of a drug or device. Our study investigated the financial conflicts of interest of open public hearing speakers at meetings of the Dermatologic and Ophthalmic Drug Advisory Committee and the Ophthalmic Devices Panel. We searched the transcripts of FDA meetings from February 2009 to October 2017 and identified speaker names, if they were affected by the disease for which the drug or device is indicated, if they were treated with the product, whether the speaker reported any COI, and if the speaker's statement regarding the product was positive, negative, or neutral toward marketing approval. Our results showed that, compared to speakers without a COI, speakers with a COI were significantly more likely to speak positively about the drug/device in question.

Utilizing Fluorescent E. coli to Study Host-Pathogen Interactions

Alissa Eberhard

Abstract

Escherichia coli (E. coli) is known to cause diseases in the gastrointestinal tract as well as urinary tract in humans. It is the causative agent for more than 75% of urinary tract infections. The expression of virulence factors like adhesins and fimbriae in pathogenic strains of E. coli enable them to colonize host cells effectively. We would like to evaluate if there are differences in the adherence and cellular trafficking patterns of non-pathogenic and pathogenic strains of E. coli. In the current study, we have used E. coli K12, which is a non-pathogenic strain. This strain can be used as a control while studying mechanisms that are employed by pathogenic strains. To facilitate the tracking of the bacteria, we prepared chemically competent bacteria using the calcium chloride method. The chemically competent bacteria were transformed with a bacterial expression plasmid encoding the green fluorescence protein (GFP) by the heat shock method. The transformation of the plasmid in the bacteria was confirmed by plasmid isolation followed by restriction digestion. We further confirmed the expression of GFP by fluorescence microscopy. We are currently working on creating fluorescent strains of E. coli that can cause urinary tract infections. By creating these fluorescent bacteria, we will be able to detect differences in adherence, invasion and trafficking between non-pathogenic and pathogenic strains of E. coli in host cells.

Isolation, Purification, Amplification and Characterization of Arthrobacteriophage, LilTroy.

Savannah Pittman

Abstract

Background: Gordonia terrae is a gram-positive non-motile, aerobic bacteria. The colonies are beige and grow well on PYCa media at 28° C. Bacteriophages are viruses that infect and kill bacterial cells. In this study bacteriophage we found infects the host Gordonia terrae (strain NRLL B-16283. All protocols were obtained from the SEA-PHAGES Phage Discovery Guide. Soil samples were collected from near a creek bed in Nicoma Park, Oklahoma (35.480007 N, 97.321025 W), and incubated with phage buffer. After filtration, the Enriched Isolation method was used to find a plague on a lawn of Gordonia terrae grown on PYCa media. The phage was purified by picking a plaque, diluting it in phage buffer, performing a 10-fold serial dilution and plating with the bacterium. This process was repeated three times to ensure adequate purification. Following amplification to a high-titer lysate, the phage DNA was extracted using the PCI method. The extracted DNA was visualized using gel electrophoresis. LilTroy is a bacteriophage that produces distinct, clear pinhead plaques on the Gordonia terrae bacterial lawn. The final lysate collected had a titer of 3.9x1013 pfu/mL. More information on LilTroy and its characteristics are available to view on the SEA-PHAGES phage database. The virus has been archived and is currently stored at the University of Central Oklahoma.

Coliphage Diversity Among Strains of E. coli in Central Oklahoma Waterways

Laura Powell & Paul Olson

Abstract

Coliphages are viruses specific to enteric bacteria found in water sources containing fecal matter. The U.S. Federal Water Pollution Act was established in 1948, followed by the Water Quality Act in 1965, to enforce specific environmental standards for freshwater sources. The purpose of this research encompasses the isolation of coliphages specific to different strains of Escherichia coli (E. coli). We hypothesize that we should be able to isolate coliphages for a variety of E. coli strains in Oklahoma waterways while demonstrating differences in coliphage density based on the presence of different strains of E. coli. Procedures employed by the U.S. Environmental Protection Agency (EPA Method 1602) were used to establish a basic protocol. E. coli HB101, E. coli B, and E. coli 11775 were grown in tryptic soy broth (TSB) at 37° C for 24 hours prior to being added to collected water samples. Water samples from Lake Overholser and the Oklahoma River were filtered and mixed with 50° C tryptic soy agar containing E. coli. Subsequent agar overlays were made and incubated at 37° C for 48 hours. Detection of circular plaques (i.e. zones of clearing) from the uniform lawn of growing bacterial cells was observed, indicating cellular lysis and ensuring host cell death had occurred. Our preliminary findings suggest we were able to isolate viruses from collected environmental samples and determine the density of coliphages for multiple strains of E. coli in Oklahoma.

Investigation of Behavioral Fever in Solenopsis invicta

Joshua Anadu

Abstract

Red imported fire ants, Solenopsis invicta (B.) (Hymenoptera: Formicidae), are one of the most ecologically damaging invasive species in North America. Therefore, understanding the colony level responses to pathogens under different temperature regimes is important to model future expansions of S.invicta and the potential for pathogen biological control under changing climate conditions. The microsporidia Kneallhazia solenopsae has been found to decrease colony growth rate and spread rapidly, which makes it a quality candidate for biological control. However, some insects have been observed increasing bodily temperatures by altering their thermoregulatory behavior to stifle the progression or eliminate pathogens. Due to the knowledge of established thermoregulatory processes. in S. invicta, it has been hypothesized that infected colonies could exhibit behavioral fever to mitigate the effects of microsporidian infection. To test this, uninfected and infected colony fragments were placed in binary choice chambers, which were identical other than the difference in temperature. Separate binary choice scenarios were run at 26-33°C (warmer) and 21-29°C (cooler). In the warmer scenario, both uninfected and infected colonies favored the cooler 26°C. However, in the cooler scenario, the uninfected ants favored the cooler 21°C, while the infected ants preferred the warmer 29°C.

The Battle of the Sexes: How female condition affects conflict over mate guarding duration in Hyalella amphipods

Shayla Miller & Rickey res

Abstract

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 hypothesized that females in poor condition with high harassment will be exposed to longer mate guarding periods because they are unable to resist male pairing attempts. To manipulate female condition, we varied the amount of spirulina, a high nutrient protein powder, that is included in a female’s diet. Harassment levels were manipulated by exposing females to one (low harassment treatment) or three (high harassment treatment) males. We found that diet had no significant effect on pairing duration, however females receiving the high harassment treatment did experience longer pairing durations compared to the females receiving the low harassment treatment. This research is important to understanding female traits that mediate sexual conflict over pairing duration in amphipod populations.

Miaurora: New Bacteriophage Isolated From Oklahoma Soil

Micah Byrne

Abstract

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, characterization, and sequencing of microbacteriophage Miaurora. Miaurora was isolated using Microbacterium foliorum as the host. The soil used for isolating phage was collected from the University of Central Oklahoma's campus (35°39'31"N 97°28'25"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 PCI method. Illumina technology was used for sequencing phage DNA. We are currently annotating our phage genome using DNA Master. Here we report the isolation and sequencing of the first microbacteriophage from Oklahoma soil. This study will help expand the knowledge of bacteriophages in Oklahoma soil.

Patterns of Litter Accumulation Within Stream Channels and Adjacent Floodplains

Dr. Andrew Taylor, Dr. Matthew Parks, Brock Archer, Dr. Emily Hendryx, & Alfonzo Cole

Abstract

Litter accumulation in local streams negatively impacts both environmental quality and public perception of natural resources. We investigated litter accumulation trends within a stream channel and its floodplain across four small urban stream sites in the Oklahoma City metropolitan area. We identified three stream unit types (riffle, run, pool) within each site.

For each stream unit, we measured litter accumulation across three perpendicular-to-stream transects with five plots spaced at proportional intervals within the stream channel. Additionally, we included a floodplain plot on each stream bank per transect. At the downstream-most transect for each stream unit, visual litter counts were also recorded from bank-full through the opposite floodplain with a rapid visual-transect count. We first present heatmaps of raw litter count and surface area data within sampled sites. We then explore trends in the dataset, focusing on differences between floodplain and in-stream accumulation, and effects of stream meandering on accumulation. Understanding where and how litter accumulates in urban stream settings will contribute to future mitigation efforts, increased public awareness, and altered perceptions of Oklahoma's natural resources.

Glutathione immobilized polycaprolactone nanofiber mesh as a dermal antioxidant delivery mechanism for diabetic patients

Tara Mazroei

Abstract

Abstract: Glutathione (GSH) is anti-inflammatory and antioxidants biomolecules. Polycaprolactone (PCL) nanofibers mesh (NFM) are capable of attaching and releasing of biomolecules for a prolonged period and has potential for use as transdermal drug delivery system. In our earlier study, we have found that the high level of sugar of diabetic male mice was significantly decreased due to daily injection of glutathione. Moreover, the oxidative stress in diabetic male mice lead to depletion of total glutathione level in body organs (pancreas, spleen, epididymus and testis). The objective of this study was to attach
GSH with PCL NFM for control release of GSH biomolecules occur from the fiber mesh to a diabetic body for a long period. This study produced PCL NFM using an electrospun technique and tested on mice to evaluate whether it can be used for dermal drag delivery mechanism. This study also dissolved GSH (2.5mg/ml) with phosphate-buffered saline (PBS) and glutaraldehyde (GLU) solution to create GSH-PBS and GSH-GLU complexes. Each complex was soaked with PCL NFM for 24 hours and dried to create PCL+GSH-PBS and PCL+GSH-GLU meshes. . Fiber morphology, degradation, fibroblast cells adhesion, cytotoxicity, and GSH release activities from each mesh was compared. Fibroblast cells adhesion and cytotoxicity tests found excellent biocompatibility of both GSH immobilized
PCL mesh and no degradation until 20 days of study period.

Bacterial analysis of Nanofiber bandage with MgO nanoparticles on Staphylococcus aureus

Sadegh Nikfarjam

Abstract

Abstract: : Prolonged antimicrobial and osteoinductive activities of polycaprolactone (PCL) nanofiber membrane (NFM) for biomedical application is possible by tethering the antimicrobial and osteoinductive molecules with PCL NFM. The effect of MgO NP in which tethered with PCL on the antimicrobial activities is not known; leading to the proposed study. The evaluation of the antimicrobial properties of PCL with and without MgO nanoparticles using Staphylococcus aureus is the purpose of this study. 100, 200 and 400mg/ml of MgO nanoparticles were immobilized with PCL in which supported by acrylic molds. : It is demonstrated that Gentamicin have inhibition zones in bacterial cultured (TSA) and turbidity tests show no signs of bacterial growth. PCL-MgON showed no inhibition zones yet no growth under the molds, and no bacterial growth according to the turbidity test which supported in vitro and lead us for further in vivo study.