

ABSTRACTS OF PAPERS PRESENTED AT THE 2008 COLLEGIATE MEETINGS

EASTERN REGION

LINCOLN MEMORIAL UNIVERSITY
HARROGATE, TENNESSEE
12 APRIL 2008

HABITAT PARTITIONING BY A SYMPATRIC COMMUNITY OF FOX (*SCIURUS NIGER*) AND GREY (*SCIURUS CAROLINENSIS*) SQUIRRELS. *Tyler Adam and John Cope-land, Lincoln Memorial University, Harrogate, Tennessee.* The purpose of this research was to study spatial and temporal habitat partitioning between a sympatric community of fox (*Sciurus niger*) and gray (*Sciurus carolinensis*) squirrels in Claiborne County, Tennessee. Eight squirrels, four of each species, were monitored using telemetry transmitters having an activity switch. Home range overlap occurred between one gray and one fox squirrel. Home range estimates are larger than those typically reported and thought to be due to a mast failure during the fall of 2007. Morning gray squirrel activity was significantly different ($P = 0.0001$) from that of fox squirrels, starting an average of 25 min earlier.

THE IMPACT OF WATERSHED DEVELOPMENT ON ZOOPLANKTON COMMUNITIES IN NORRIS LAKE, TENNESSEE. *Casey B. Dunn and Agnes Vanderpool, Lincoln Memorial University, Harrogate, Tennessee.* Zooplanktons are ecological indicators of the health of an aquatic habitat due to their reliance on phytoplankton communities as a food source, which are in turn, directly linked to the nutrient load present in the water. In 2007, four study sites with developed watersheds were sampled monthly. Collected specimens were identified and individually counted according to genus. Diversity indices from study sites were compared for significant differences to two reference sites having no visible watershed disturbance. Study sites from the Clinch River branch of the Norris reservoir showed significant differences in zooplankton diversity compared to the reference cove. Study sites on the Powell River branch of the Norris reservoir showed low species diversity in early spring months at study sites relative to the reference site. Results of the study suggest that watershed development may be affecting zooplankton communities on the Powell River branch of the Norris reservoir.

SEXUALLY TRANSMITTED DISEASES IN EAST TENNESSEE: A STUDY ABOUT SYPHILIS AND GONORRHEA IN CLAIBORNE AND HAMBLÉN COUNTY, TN. *Chasity Danielle Long and Tiffany Alley, Lincoln Memorial University, Harrogate, Tennessee.* A sexually transmitted disease (STD) is a disease transmitted through sexual contact between two people. An STD may be transmitted through the exchange of blood, semen, and other body fluids or by direct body contact. There are currently more than twenty different sexually transmitted diseases known. In this study, the incidences of two specific

sexually transmitted diseases, syphilis and gonorrhea, were examined. The purpose of the study was to first compare the rates of syphilis and gonorrhea in Claiborne County and Hamblen County, Tennessee, between the years of 2000 to 2006. The rates of syphilis and gonorrhea were then broken down into age groups and were also separated into two categories of race, African American and Caucasian. The rates of the disease in the two counties of East Tennessee will then be compared to the national rates of syphilis and gonorrhea.

THE EFFECTS OF NOISE ON COGNITIVE PERFORMANCE. *Michelle R. Dodson and Christy Cowan, Lincoln Memorial University, Harrogate, Tennessee.* The purpose of this experiment was to explore the effects of noise levels on cognitive performance. Cognitive performance was measured by use of an assessment of reading comprehension during periods of no noise, moderate noise (50–70 decibels), and high noise (70–80 decibels). Participants completed the assessment while listening to noise through headphones. The hypothesis was that the no noise group would perform best, the moderate noise group would perform lower, and the high noise group would have the lowest performance. A one-way independent groups ANOVA was run to compare the groups ($F = 0.516$; $P > 0.05$). The results show that the average performance of the no noise group (87.5) was higher than the average performance of the moderate (80.0) and high (82.5) noise groups. However, the results were not significant. Future research would use a larger and more diverse sample and a shorter time limit for assessment completion.

A NOVEL USE OF LINEAGES IN THE ANALYSIS OF EFFECTIVE POPULATION SIZES OF A SOLITARY CARNIVORE. *Amjad M. Nasir, Florence A. Okenkpu, John R. Hisey, Popoh A. Atairu, Michael L. Kennedy, and Brian D. Carver, Lee University, Cleveland, Tennessee (AMN, FAO, JRH, PAA), The University of Memphis, Memphis, Tennessee (JRH, MLK, BDC), and Freed Hardeman University, Henderson, Tennessee (BDC).* Effective population size (N_e), broadly applied in evolutionary and conservation genetics, is the size of a group following Hardy-Weinberg assumptions that loses genetic variation at the same rate as the actual population studied. Typical determinations yield N_e smaller than the census size (N_c). A few atypical recent studies of social species incorporate lineage effects and reveal N_e larger than N_c indicating reduced loss of genetic variation over time. Our study on raccoons (*Procyon lotor*) indicates for the first time that these effects also occur in the much more abundant solitary mammals, in which many species also maintain lineages of nearby related individuals through philopatry of only one sex. Our N_e values for raccoons were substantially larger than N_c but inversely correlated with dispersal of the philopatric sex. Conservation breeding programs ignoring these effects and incorporating artificial dispersal of the philopatric sex can actually hasten loss of genetic variation (decrease N_e).

LINEAGE EFFECTS ON INBREEDING COEFFICIENTS OF A SOLITARY CARNIVORE. *Popoh A. Atairu, John R. Hisey, Michael L. Kennedy, and Brian D. Carver, Lee University, Cleveland, Tennessee (PAA, JRH), The University of Memphis, Memphis, Tennessee (JRH, MLK, BDC), and Freed Hardeman University, Henderson, Tennessee (BDC)*. Population genetics models typically assume equal dispersal among the sexes and random mating that actually do not occur in many species. In solitary mammals including the North American raccoon (*Procyon lotor*), sexual differences in dispersal and unequal breeding among individuals may produce lineages of female kin and offspring living in close proximity. This first application of a lineage structured genetics model to a solitary mammal produced estimates for F_{IL} (nonrandom breeding within lineages) of -0.121 and F_{LS} (genetic differentiation among lineages) of 0.108 for the raccoon. These measures are similar in magnitude to estimates for more social species and indicate breeding orders of magnitude less random than the equivalent measures for larger groups of raccoons. These dominant effects in local gene dynamics, though not incorporated in typical models, may deter inbreeding within lineages while maintaining genetic differentiation among lineages that allows development of cooperative traits and adaptation to local conditions.

THE LAND SNAILS OF NORRIS DAM STATE PARK, TENNESSEE: SPECIES DIVERSITY AMONG FOUR PHYSICAL COMMUNITIES FOUND WITHIN THE PARK. *Daniel A. Douglas and Ron Caldwell, Lincoln Memorial University, Harrogate, Tennessee*. The purpose of this study was to examine terrestrial Mollusca diversity among four physical communities within Norris Dam State Park. Physical communities examined were: North Facing Slopes, South Facing Slopes, Ridge Tops, and Hollows. Two 120 meter lines were established in each physical community. Six points were established along each line. Plant community analysis was conducted using Point-Quarter sampling. Dominate tree and shrub species were determined for each physical community. Both macro (> 5 mm) and micro (< 5 mm) snails were collected using leaf litter bags. Four leaf litter bags were collected at each point. Snail species diversity and evenness among physical communities was determined using Shannon-Wiener Index (H'). H' values were then subjected to an Analysis of Variance which revealed no significant differences.

A COMPARISON OF BENTHIC MACROINVERTEBRATE COMMUNITIES IN TWO EASTERN KENTUCKY HEADWATER STREAMS AFFECTED BY MINING ACTIVITY. *Amy S. Wilson and George Mears, Lincoln Memorial University, Harrogate, Tennessee*. This study focused on benthic macroinvertebrate communities in two headwater streams, located below an old surface mine in Bell County, Kentucky. Benthic macroinvertebrates were collected in the field during the months of November 2007 and March 2008 using a Surber net and *in situ* water chemistry was conducted using an YSI 256 Multi-Probe System and a LaMotte Smart II Colorimeter. Community analysis of the two streams was done two ways; using a t-test at an $\alpha = 0.05$ with calculated Shannon-Wiener Index and Evenness and six Benthic Metrics designed by Kentucky's Macroinvertebrate Assessment Index (Pond and McMurray, 2000, unpublished) and EPA Rapid Bioassessment Protocols (Barbour et al., 1998). Both community analyses yielded no significant differences.

HYDROELECTRIC POWER THROUGH TVA. *Jade N. Byrd and Eugene de Silva, Lincoln Memorial University, Harrogate, Tennessee*. This paper will discuss the variables that affect the quality and quantity of hydroelectric power in two of the dams in the Tennessee Valley Authority system: Norris Dam in Norris, Tennessee, and the Ocoee 2 Dam in Ocoee, Tennessee. Such variables as dam height, water speed, the path of the water, and the amount of water will be examined, and their effects on the amount of energy produced will be determined.

THE EFFECT OF THE ANGLE THETA WHILE MEASURING BLOOD FLOW VELOCITIES USING DUPLEX DOPPLER. *Anna Eldridge and Eugene de Silva, Lincoln Memorial University, Harrogate, Tennessee*. Diagnostic Ultrasound is a valuable tool for imaging the various diseases of patients. Understanding the effect of the Doppler angle on blood flow velocities was the goal of this research project. The methodology and results of this paper were based on samples obtained via duplex Doppler velocities of the left brachial artery blood vessel. An increase in velocities was an indication of pathology. The accuracy of the velocity measurements made depended on the cosine of the angle theta at which the velocities were measured. The scale of the research was performed on twenty patients with non-diseased brachial arteries, using a diagnostic ultrasound machine. The angles used to measure blood flow velocities were at; 0, 15, 30, 45, 60, 75 and 90 degrees. The results proved that angle of 60 degrees represented a true velocity of blood flow in the artery being interrogated.

A COMPARATIVE STUDY OF THE IMPACT OF FOUR DIFFERENT ARROWS AND FOUR DIFFERENT ARROW TIPS. *Sheryl Hill and Eugene de Silva, Lincoln Memorial University, Harrogate, Tennessee*. The purpose of this study was to determine the most effective arrow-tip combination for a sixty-five pound parker bow. The velocity and the impact of four different arrows and tips were compared using the basic kinematics and kinetic energy equations. A chronograph was used to calculate the velocity. The control factors were the bow, arrow length, and the archer. All measurements were taken indoors to minimize wind resistance. As the field tip grain was increased the velocity decreased. As the field tip grain was increased the impact depth tended to increase. In this study, the limiting factors of this research would also be discussed.

A STUDY OF CONSISTENT PRECISE ELECTROCARDIOGRAPH LEAD PLACEMENT FOR 12-LEAD ECG FOR MORE ACCURATE DIAGNOSIS. *Stanley Marlowe and Eugene de Silva, Lincoln Memorial University, Harrogate, Tennessee*. A 12-Lead Electrocardiograph is commonly used in hospitals and clinics across the country. For an accurate 12-lead ECG the electrodes should be placed in the same position on a patient each time an ECG is done. During this research project 30 males between the ages of 18 and 40 were subjected to a series of ECG's. The first ECG performed established a baseline, with all leads in proper textbook fashion. Following the proper placement graph, 8 additional ECG's were performed on each person. The additional ECG's had slightly abnormal electrode placement on 7 of the graphs and transverse placement on the eighth one. The results were analyzed to highlight the quality assurance aspects of measuring ECGs through a correlation with the amplitude and deflection of waveforms.

THE EFFECTIVENESS OF BOOSTER SEATS FOR CHILDREN BETWEEN THE AGES FOUR TO NINE YEARS. *Jane A. Shaw and Eugene de Silva, Lincoln Memorial University, Harrogate, Tennessee.* This research was conducted to ascertain whether booster seats were effective as a tool to prevent or reduce injury to children between the ages four through nine who were involved in a motor vehicle collision. The main objective was to compare the data available of accident injuries, before and after the booster seat laws were passed. The other objective was to review the difference in how the United States obtains and presents this data, as opposed to Europe or Australia. The results obtained proved that though data had been collected and presented differently, booster seats have been effective. In conclusion, booster seats should continue to be mandated with the understanding that no system is infallible. There are several layers of data for a parent to wade through when deciding which booster seat is appropriate for their child.

ENZYMATIC CONVERSION OF SWITCHGRASS TO ETHANOL. *Scott Keith and Roy Wilcox, Lincoln Memorial University, Harrogate, Tennessee.* With dwindling fossil fuel resources and increased oil prices worldwide, researchers are actively seeking renewable and more economic energy sources. One such source is biomass, a cellulosic (or plant) material, from which fuels such as ethanol can be created. This study will examine the process of Simultaneous Saccharification and Fermentation (SSF) using the warm season grass Switchgrass and whether or not the addition of sugar during the process will cause an increase in the amount of ethanol produced.

PHYSICS AND RESEARCH. *Beth Ann Mattie and Eugene de Silva, Lincoln Memorial University, Harrogate, Tennessee.* Physics is defined as the experimental science of matter and its motion, as well as space and time. In other words, physics analyzes the world around us in order to better understand the way things work. One way that the core concepts of physics (energy, mass, velocity, inertia, and force) can be understood is through the use of research. Using martial arts to introduce research in physics in the classroom is a great way to increase students' interest in science while demonstrating the principles behind physics. Research has shown that through various techniques such as breaking a tile one can easily see interesting and amazing applications to the science of physics.

MIDDLE REGION

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TESTING THE RELATIVE RELATEDNESS AND INBREEDING IN THE MONTGOMERY BELL STATE PARK TERMITES. *Iveylee B. Trump, Edward Vargo, and Steven Murphree, Belmont University, Nashville, Tennessee.* Colonies of eastern subterranean termites, *Reticulitermes flavipes*, have been shown to possess a relatively high degree of inbreeding. In this study, we follow up on a previously published study that reported an unusually high degree of inbreeding at Montgomery Bell State Park in Burns, Tennessee. By using PCR and microsatellite technique, we analyzed specimens collected from ten colonies at

one site. By comparing different loci within each colony, our data shows a different conclusion than those previously reported. The termites at Montgomery Bell State Park show normal levels of inbreeding in relation to past studies. It is possible that there was a defect in the allozyme markers used in the previous investigation or that there were newly founded colonies under genetic drift at the time of the previous research.

AFLP ANALYSIS OF SIX HEIRLOOM TOMATOES. *S. Silpa Pallapothu and A. Naseer Aziz, Tennessee State University, Nashville, Tennessee.* Heirloom varieties typically have value-added traits such as attractiveness of fruits, limited availability, unique flavor or other traits not found in commercial varieties. Since heirloom tomato varieties may require a little more care during production or handling, compared to commercial hybrids, producers can obtain a higher price when appropriately marketed. Amplified length polymorphism (AFLP) molecular markers can help to understand the genetics of desirable characters and to locate genes for value-added traits in these genomes. In this research, purified DNA samples were extracted from six heirloom tomato (*Lycopersicon esculentum*) varieties, i.e., Russian, Marizol Red, Andrew Rahart Jumbo, Brandy Wine, Tidwell German and Brimmer. AFLP generated DNA fragments were then separated by sequencing gel electrophoresis using an automated DNA analyzer (Global IR² DNA Analyzer and Sequencer, Li-Cor Inc., Lincoln, NE, USA). Using Saga Generation 2- AFLP[®] Analysis (Li-Cor Inc., Lincoln, NE, USA) software, AFLP profiles are currently being analyzed to generate binary-code (0/1) reports on markers' data were generated. TreeCon-Dendrogram (Scanalytics Inc., Fairfax, VA, USA) software will be used to analyze the data to deduce genetic relationships between these heirloom tomato varieties.

FROM AIR POLLUTION TO TOXIC WASTER: THE TRADE-OFFS FOR CFLS. *Juanita Baker, Austin Peay State University, Clarksville, Tennessee.* Environmentalists and the lighting industry are making a concerted effort to sell the American public on cooler operating, energy saving and longer lasting compact fluorescent lamps (CFLs). Switching to CFLs makes economic sense, and reduces environmental and human health costs by reducing demand for coal-produced electricity and its greenhouse gas and mercury by-products. Recent federal legislation mandates switching to this new technology. Largely unaddressed is the problem of managing CFLs as waste. CFLs contain mercury, earning them an EPA hazardous waste classification and complicating handling and disposal. Few businesses are EPA certified for mercury extraction and recycling. One such certified recycler is Southeast Recycling Technologies of Johnson City, TN. Southeast transports, stores, and recycles or provides disposal for mercury collected from nine southern states. It is utilized here in a discussion of potential widespread problems in safe handling, transfer and transportation, and ultimate recycling or disposal of CFL mercury.

ASSESSMENT OF CHROMATE COPPER ARSENATE IN TREATED WOOD. *Kathrine R. Stevenson, Austin Peay State University, Clarksville, Tennessee.* Treated lumber is created through high pressure saturation of wood with the chemical compound chromate copper arsenate (CCA), a mixture of copper, arsenic and chromium. Arsenic deters termites, copper stops fungus and rot, and chromium helps bind the compound to the wood. CCA is a widely utilized wood protection extending the

consumer life woods such as southern pine from years to decades. It is not without its share of controversy, and the advantages of treated wood come with potential human health and environmental risks. Despite treated lumber industry claims that treatment chemicals remain bound to wood matter, evidence indicates that over time CCA arsenic leaches out of treated lumber into the environment. This presentation is part of a larger research examination of potential CCA "cradle-to-grave" hazard, seeking to identify what changes, if any, are needed to strengthen regulation of CCA and its utilization in wood treated products.

THE PRAIRIE FOREST TRANSITION: OCCURRENCE AND ARCHITECTURE OF NATIVE AND INVASIVE SHRUBS. *Brittany Card and A. Darlene Panvini, Belmont University, Nashville, Tennessee.* The distribution and architecture of exotic and native shrubs were examined along a prairie-forest transition in Beaver Dam state Park in Carlinville, Illinois. Three transect lines consisting of both an 'edge' plot and a 'woody' plot 9 m inside the forest were established on three different prairies. Shrubs were counted and measured in all plots, and the burning records for each woody site were obtained. The results indicate a greater number of exotics in the woods in comparison to the prairie-forest edge. Exotic shrub species were also larger than native shrubs, which correlates to the presence of larger shrubs in woody plots. The size and distribution of exotic shrubs suggest that prairie woods should be burned every 8 to 12 months to reduce the frequency of exotics.

EXAMINING THE IMPACT OF HUMAN ACTIVITY ON SWAN LAKE. *Jill A. Neblett and A. Darlene Panvini, Belmont University, Nashville, Tennessee.* Swan Lake is a human-created lake located in Dunbar Cave State Natural Area in Clarksville, TN. The lake is surrounded by various human-influenced habitats, such as a golf course and a road, and one side is bordered by the entrance to a cave. This study evaluated the overall quality of water in the lake to determine if nearby human activities negatively impact the lake. Over the period of one month, eleven variables of water quality were measured each week on four sides of the lake. The results indicate that the overall water quality is good and that none of the human-influenced habitats appears to negatively affect overall quality. However, some of the individual variables (e.g. water temperature, pH, and turbidity) did appear to be influenced by the surrounding habitat. Information from this study can be used by the natural area staff in setting guidelines for managing the lake and surrounding property.

DIVERSITY OF SOIL BACTERIA AROUND NATIVE AND EXOTIC PLANTS. *Amy Nause and A. Darlene Panvini, Belmont University, Nashville, Tennessee.* The introduction of exotic plant species into an area can significantly alter the diversity and composition of the soil bacteria community. Three sites at Warner Parks, Nashville, TN, were identified as having areas significantly covered by exotic *Lonicera maackii* as well as areas containing only native species. Six soil samples were taken from each site, three under the *Lonicera* and three under native species. The soil samples were diluted and plated on nutrient agar to grow bacteria. Each bacterium was isolated and re-plated to grow pure colonies. Colony color, shape, and margin description were used along with Gram staining and bacteria shape to identify the different types of bacteria present in the soil samples. More bacteria types were present in the soil samples underneath

Lonicera. The ecological significance of changes in bacterial communities in relation to the presence/absence of exotic plant species will be considered.

INSECT HERBIVORY ON EXOTIC VINCA AND NATIVE GOLDENSEAL. *Annie Lou M. O'Steen and A. Darlene Panvini, Belmont University, Nashville, Tennessee.* Preliminary studies in Warner Parks, Nashville, TN, during 2006 suggested that levels of herbivory on exotic species were less than those on native species. The current study examined levels of insect herbivory on exotic vinca and native goldenseal plants by counting the number of leaves with herbivory and assessing the percent leaf area chewed by insects. Leaves of both species were collected, scanned, and digitized so that leaf surface areas of the digital images could be measured using ImageJ. Insects were collected using pit-traps and sweep nets in the areas underneath and around the plants to determine potential insect herbivores. Goldenseal had significantly more leaves and greater surface area affected by herbivory. Diversity of insects found around the plants varied slightly. The impact of exotic plant species on insect diversity and overall ecological processes will be considered.

HISTIDINE DECARBOXYLASE ASSAY BY CAPILLARY ELECTROPHORESIS. *Rachel Stephens and Kent Clinger, Lipscomb University, Nashville, Tennessee.* The catalyzed conversion of histidine by the enzyme histidine decarboxylase produces histamine, found in animals, plants, and microorganisms. An assay for histidine decarboxylase was performed using capillary electrophoresis. Capillary electrophoresis is a desirable method for this assay because it requires very small samples and yields good separation. The reaction was carried out using Histidine decarboxylase derived from *Lactobacillus* and L-histidine. The histidine decarboxylase reaction was carried out in an acetate buffer (pH 5), and samples were run on the capillary electrophoresis in a tris hydrochloride buffer (pH 8). Because histidine has an isoelectric point of 7.6 and histamine has an isoelectric point of 8.4, a buffer of pH 8 was used for maximum separation.

NOVEL MICROMIRRORS TO OBTAIN THREE-DIMENSIONAL IMAGES OF CELLS. *Charles S. Wright, Ron Reiserer, Kevin T. Seale, and John P. Wikswo, Vanderbilt University, Nashville, Tennessee.* Confocal scanning laser microscopy and multiphoton microscopy provide 3D data from biological specimens, but with limited z-axis precision. We are developing a system which uses multiple microscale mirrors to obtain more accurate 3D data on living cells while using classical widefield microscopy. Etched silicon wells coated with aluminum have been used to obtain 3D images of pollen grains and protozoa. Reflections from the angled sides of the well provide information along the z-axis, and a back-projection algorithm can be used to reconstruct a 3D image. To supplement measurements obtained with this method, we are optimizing a system which allows for rotation of a cell attached to a pulled glass tip, giving images from multiple vantage points. Data from both methods can be used to measure the volume of an individual budding yeast cell as it progresses through the cell cycle. This cell's roughly prolate spheroidal shape gives data suitable for fitting to a simple 3D surface, whose integration provides the volume.

CALIBRATION PROCEDURE FOR OXYGEN SENSING FILM IMAGES. *Kathleen Grunder and John Wikswo, Vanderbilt*

University, Nashville, Tennessee. Our research goal is to develop an oxygen sensing film based on illumination and emission of a fluorescence based reporter molecule. Several complications with the microscope excitation illumination and camera instrumentation made calibration of our measurement system a necessity. There was significant non-uniform illumination of the field due to: the lens transfer function of the emission pathway, non-uniform excitation illumination, optical vignetting, and pixel responsivity (dead pixels), and camera background noise. There were also quantization issues stemming from various software packages processing the image in different ways. Scaling factors had to be applied in order to make the images comparable to one another. In order to calibrate the system, but still maintain the greatest depth of range possible, sixteen bit images of the fluorescent fields were taken using a cooled ccd camera and then scaling the image by multiplying each pixel by some specific calibration number. Calibrating the image should flatten the reported intensity field and make it comparable to other calibrated images. Experiment images were divided on a pixel by pixel basis by a raw calibration image with uniform fluorescence. The experimental attempts at calibration have yielded calibrated images with a relatively flat field that compensates for non-uniform illumination and lens transfer artifacts.

CHARACTERIZATION OF CDTE NANOPARTICLES PRODUCED BY PULSED ELECTRON BEAM DEPOSITION WITH VARIED PRESSURE. *Monique D. Ewan, Tololope B. Fatokun, Akira Ueda, and Richard Mu, Fisk University, Nashville, Tennessee.* Pulsed Electron Beam Deposition (PED) is a newly developed ablation technique for producing nanoparticles and films. PED has distinct advantages of being cost effective and results in large-scale production. If the ablation or deposition parameters are carefully controlled, then high quality nanoparticles can be produced. These parameters include background gas pressure, target - substrate distance, charging potential and types of backing gases. Recently, we have successfully employed PED to deposit Cadmium Telluride (CdTe) semiconductor material on ZnO nanowires in an effort to develop high solar energy conversion photovoltaic devices. It becomes evident that the optimization of solar energy conversion will depend on the quality of the CdTe nanoparticle formation. As a first step, effort is made to investigate the effect of background gas pressure on the particle size, size distribution, and number density of CdTe nanoparticles. PED experiments, then, were carried out to deposit CdTe on Mica at background gas pressures of 17, 15, 13, 11, and 9mTorr, respectively. The samples were then imaged with Atomic Force Microscope (AFM). After this, a section analysis was performed to determine the particle size distribution of the samples. Results show that with a decrease in background gas pressure, there is an increase in the CdTe particle size and a decrease in the number of nanoparticles per unit area. For the 9mTorr sample, no obvious nanoparticles were observed with the AFM.

CONTROLLING CELLULAR GALVANOTACTIC RESPONSE IN A MICROFLUIDIC DEVICE. *Arunan Skandarajah, Devin B. Henson, John Wikswo, and Chris Janetopoulos, Vanderbilt University, Nashville, Tennessee.* Electrical fields are generated in both normal and pathological physiology. Differences in ion concentrations across barriers such as skin or organ walls cause these fields, and cellular response to electric fields has

been under-explored because of deficiencies in the current devices available. In the course of this project we are seeking to develop a device on the microfluidic scale that will address problems with the current and promise a platform for rapid production of experiment-specific devices. We have followed the design process through several iterations, and through continuous modification we have translated our concept to a functional prototype electrical gradient generator. Characterization of this device has included determining the electrical potential profile across the experimental area for a given applied voltage and the detection of possible pH gradients. Our current task is the validation of this device with respect to published literature on the migration rates at particular voltages *Dictyostelium discoideum*, a ubiquitous model for amoeboid crawling movement. We hope to do this by developing software for quantifying the motility rates and directedness of these cells under time lapse microscopy.

CALCIUM RELEASE ACTIVATED CALCIUM CHANNEL CYCLING IN CD 4+ T-CELLS USING MICROFLUIDIC DEVICES. *Stephen Arndt, Matt Pfister, Kevin Seale, and John Wikswo, Vanderbilt University, Nashville, Tennessee.* In CD 4+ T-cells, the calcium release activated calcium channel plays a significant role in mediating the cell activation, and thus the immune response. The pathway to T-cell activation starts with antigen presentation using surface proteins from antigen presenting cells which cause calcium release from the sarcoplasmic reticulum via the IP₃ DAG pathway. This calcium release leads to further calcium release as the calcium release activated channel allows extracellular calcium into the cell and starts the T-cell activation pathway. Ionomycin can be used to short circuit this pathway, as it acts to transport calcium across the plasma membrane and begin T-cell activation. In vivo the T-cells naturally calcium flux and this calcium fluxing could have significant effects on the immune response of the body. Using microfluidic devices we can trap thousands of cells exposed to ionomycin, and measure the response of single cells using a calcium sensitive fluorescent dye. Most experiments are forced to rely on the average population values. These experiments are aimed at measuring the levels of fluorescence of individual cells. In the future the experiments will also explore the molecular method of action of ionomycin, whether it is a pore or a molecular chaperone, and measure the change metabolic activity of the cells once exposed to ionomycin.

BLOOD SEPARATION IN MICROFLUIDIC DEVICES. *Eric Chung and John Wikswo, Vanderbilt University, Nashville, Tennessee.* Microfluidics is a relatively new area of science used in measuring biomedical signals. Blood cells were trapped and then separated. The difficulty in this experiment is that trapping cells because it requires extreme amount of precision. However, to add on to that difficulty, the experiment focuses on separating white and red blood cells within the device. Because of the shape of red blood cells, the device is capable, with the correct trap size, to trap white blood cells and allow red blood cell will flow through. The second part of the experiment is focused on creating single cell measurements and determining cell characteristics. By obtaining fluorescently marked CD markers, the strength of the fluorescence shows the amount of clusters that respond to the marker. CD markers were shown to display greater fluorescence when bound and were easily distinguishable from the media that the cells are suspended in. For the purpose

of using multiple CD markers the syringe pump was placed at the output of the device instead of the input and pulled back on. At the input of the device a computer controlled valve bank created through unique photolithography technique. The results showed that white and red blood cells can be separated by size. Platelet congregation interfered slightly with the separation. However, most of the cells remaining within the device were white blood cells. Microbeads were used to test the new method of pumping and worked similar to the forward pumping method. The valve bank fabrication is still undergoing work and needs test in repeatability. The cells were marked with three different CD markers and showed fluorescent under different filters. This showed that white blood cells could indeed be differentiated by using multiple markers and filters under microfluidic devices.

ELECTROFUSION OF *DICTYOSTELIUM DISCOIDEUM* AND ITS APPLICATIONS. *Eric Z. DeLong, Kevin Seale, and Chris Janetopoulos, Vanderbilt University, Nashville, Tennessee.*

Electrofusion is used in biological applications to fuse two or more cells together, effectively making the pair/group into a single cell with one outer membrane. Recent developments in biotechnology have provided an cost-effective and simple way to perform such a process in a microfluidic device. This method provides for a wide range of applications in the laboratory. Most notably, the process allows for the fusing of cells expressing two different fluorescent proteins. In addition, cells at different stages in the cell cycle or cells treated with different drugs can be fused together to provide a better understanding of various signaling pathways and intracellular relationships. Electrofusion has a wide variety of applications, from cancer immunotherapy to the mapping of chromosomes. The applications of this method in the field of *Dictyostelium* have been explored to some extent, and we wish to go further. With new developments in biotechnology, this has become possible.

MAINTAINING LONG-TERM CELL VIABILITY IN A PERFUSED BIOREACTOR SYSTEM. *Jenny Q. Lu, Lisa McCawley, and Dmitry Markov, Vanderbilt University, Nashville, Tennessee.*

Fabrication of a small scale bioreactor system with improved delivery of drugs or assay reagents can be highly beneficial to the development of an anti-tumor therapy, and key cellular functional signatures will be identified to predict the response to anti-tumor therapy. Experiments show that 5000 cells/chamber of human mammary epithelial cell lines (MCF10A) in chamber slide is optimal for the 3D formation of acini morphology or mammosphere during 20 days, and that correlates to 2000 cells/well in the parallel channel bioreactor. After comparing the gene expression profiles from Microarray Data Set, only a few protease family classes are differentially expressed by four cell lines. Effects of individual inhibitors and protease cocktails are compared. 1 μ M of *Calcein AM* and 2 μ M of *Ethidium Bromide* are the optimal concentrations for the live-dead viability assay. The new and improved parallel channel bioreactor design is a high thru-put device that allows optical capabilities.

OPTIMIZATION OF DMSO (DIMETHANOL SULFOXIMIDE) IN PRESERVING HUMAN CELL LINES. *Olukemi Gbemisola Jolayemi, Benny Washington, and E. Lewis Myles, Tennessee State University, Nashville, Tennessee.* Preservation of cell lines can be a very expensive process. Many labs store their cells in liquid nitrogen. This technique can be very expensive because of

replenishing the nitrogen. A recent publication used attached cells that preserved in DMSO. In our investigation, our goal was to determine the specific concentration of DMSO (5, 10, or 20%) that would efficiently preserve our cell lines under a cryostat environment of -70°C . We used 12 well plates to initiate the experiments with 300,000 cells per well. The cells were frozen and periodically removed from the freezer. Cell viability was determined using Alamar Blue. Alamar Blue is a safe, nontoxic aqueous dye that is used to assess cell viability and cell proliferation and is supplied as a sterile indigo colored liquid. Alamar Blue has also been shown to be a rapid and simple non-radioactive assay alternative to the $[3\text{H}]$ thymidine incorporation assay. Alamar Blue is soluble, stable in culture medium and is non-toxic. The continuous monitoring of cells in culture is therefore permitted. Specifically, Alamar Blue does not alter the viability of cells cultured for various times as monitored by Trypan Blue exclusion. Cells grown in the presence of Alamar Blue; and subsequently analyzed by Flow Cytometry for CD44, CD45RB, CD4 and heat stable antigen are found to produce similar numbers of viable cells and antigen expressing cells as non- Alamar Blue exposed cells. Because Alamar Blue is non-toxic, the cells under study can be returned to culture or used for other purposes including histological studies. Proliferation measurements with Alamar Blue may be made either spectrophotometrically by monitoring the absorption of Alamar Blue supplemented cell culture media at two wavelengths.

THE EFFECT OF BITTER MELON ON CANCER CELLS. *Ikeia Holyfield, Clifton Randell, Benny Washington, and E. Lewis Myles, Tennessee State University Nashville, Tennessee.*

The purpose of this experiment is to test a plant called bitter melon and see if it is anti-cancerous. Bitter melon, also known as karela or *Momordica charantia*, is an herb that helps regulate blood sugar levels and keeps body functions operating normally. Bitter melon may have anti-tumor capabilities. It seems to increase wounds healing, and possibly anti-inflammation. Our research inquire about to determine if bitter melon inhibit growth on cancer cells. It contains Gurmarin, a polypeptide similar to bovine insulin, which shows a positive sugar regulating effect by suppressing the neural response to sweet taste stimuli. Bitter melon grows in tropical areas, including parts of the Amazon, east Africa, Asia, and the Caribbean, and is cultivated throughout South America as a food and medicine. I will be testing this herb three different ways on breast cancer cells to see if this plant known as bitter melon is anti-cancerous or not.

DIFFERENTIAL LOCALIZATION OF MMP-2 ISOFORMS IN AUTOIMMUNE THYROID TISSUE. *Naveen Mohyuddin and Michael Thompson, Belmont University, Nashville, Tennessee.*

Recent evidence suggests that a catalytic domain fragment of MMP-2 (42 kDa), but not the full-length form (62 kDa), is inhibited by lactoferrin. It is also known that the hemopexin domain (20 kDa), from the 62 kDa domain, disrupts integrin signaling. Little is known regarding the extent of breakdown of active 62 kDa MMP-2 in normal or diseased tissue. Normal and autoimmune thyroid tissues were examined by immunohistochemical localization to examine the degree of MMP-2 autocatalytic processing. Antibodies corresponding to both the catalytic domain and the hemopexin domain were utilized and tissues were observed under both ultraviolet and visible light microscopy. Images were merged to determine the extent of overlapping staining. While results regarding the proteolytic

processing of MMP-2 were inconclusive, it was observed that MMP-2 is expressed at extremely high levels in autoimmune thyroid tissue, indicating that MMP-2 may be responsible for much of the tissue damage and rearrangement observed in these tissues.

INHIBITION OF HUMAN NATURAL KILLER CELL LYTIC FUNCTION BY THE BROMINATED FLAME RETARDANTS, HEXABROMOCYCLODODECANE AND TETRABROMOBISPHENOL A. *Krishna Stephen and Margaret Whalen, Tennessee State University, Nashville, Tennessee.* Hexabromocyclododecane (HBCD) and Tetrabromobisphenol A (TBBPA) are used as flame retardants in a variety of materials. HBCD has been found in sediments and in fish. TBBPA has been found in drinking water stored in polycarbonate containers, and in human hair and blood samples. Human natural killer (NK) lymphocytes are able to destroy (lyse) tumor and virally-infected cells. They are responsible for limiting the spread of blood-borne metastases as well as limiting the development of primary tumors. Thus, any agent that interferes with the ability of NK cells to lyse their targets could increase the risk of tumor incidence and/or viral infections. This study evaluated the ability of HBCD and TBBPA to interfere with the lytic function of human NK cells using a chromium release assay. Highly purified human NK cells were exposed to 10, 5, 2.5, 1, 0.5 and 0 μM HBCD or TBBPA for 24 h. Exposure to either 10 μM HBCD or TBBPA caused NK cells to lose greater than 90 percent of their ability to lyse tumor cells. Exposure to as little as 2.5 μM HBCD for 24 h was able to reduce lytic function by about 50%. While exposure to 0.5 μM TBBPA was able to decrease the lytic function of NK cells by about 30% after 24 h.

T-CELL CYTOKINES ASSOCIATED WITH INFLAMMATORY BOWEL DISEASE IN MDR KNOCKOUT AND CHIMERA MODELS. *Dale S. Carter, Julia M. Schmitz, Vance J. McCracken, Reed A. Dinmitt, Robin G. Lorenz, and Jennifer T. Thomas, Belmont University, Nashville, Tennessee (DSC, JTT), and University of Alabama—Birmingham, Birmingham, Alabama (JMS, VJM, RAD, RGL).* Chemotherapy resistance has become one of the most serious difficulties associated with cancer treatment. The multidrug resistant (MDR) gene, which encodes for p-glycoprotein, has been shown to contribute to this chemotherapy resistance by pumping lethal doses of chemotherapeutic agents out of cancer cells. In order to determine the normal function of p-glycoprotein, a knockout mouse was created. Interestingly, the loss of p-glycoprotein in the knockout mouse resulted in serious Inflammatory Bowel Disease (IBD). IBD is thought to be due to a dysregulated immune response to the toxins produced by the microbiota of the gastrointestinal tract. Past studies have ruled out CD8^+ T cells as the cause of IBD and it is theorized that another subset of T cells, CD4^+ T cells, is responsible for this disease. In order to determine what particular CD4^+ T cell types are causing IBD, 1 extracted RNA from colon samples of wild type, *mdr* knockout, and two bone marrow chimeras that express p-glycoprotein in either bone marrow derived or intestinal epithelial cells. The RNA was transcribed into cDNA and then put through Real-Time reverse transcriptase PCR to detect the specific cytokines derived from the different T cell types. The cytokines of Th1, Treg, and Th17 cells were detected in the highest amounts. Cytokines from Th2 cells showed the lowest level of expression. In all the diseased animal models the Th17 cytokines were detected in vastly higher

amounts. This seems to indicate that the Th17 cell may play a more important role in causing IBD.

DECREASES IN ATP LEVELS OF HUMAN NATURAL KILLER CELLS INDUCED BY EXPOSURE TO PENTACHLOROPHENOL. *Ugochukwu Nnodu and Margaret Whalen, Tennessee State University Nashville, Tennessee.* Pentachlorophenol (PCP) is an organochlorine compound that has been used as wood preservative for power-line poles and fence poles. Pentachlorophenol (PCP) has been detected in human tissues. Human natural killer (NK) cells play a central role in immune defense against viral infection and tumor development. In previous studies we have shown that exposure to 10-0.5 μM PCP decreases the tumor-killing (lytic) function of NK cells. The purpose of the study was to examine whether there was an association between loss of lytic function and decreased ATP levels as well as the ability of antioxidants to prevent any PCP-induced decreases in either ATP levels or lytic function was also examined. NK cells were exposed to PCP at concentrations ranging from 10 to 0.5 μM for 24 and 48 h. ATP levels were decreased by 15% in NK cells exposed to 10 μM PCP for 24 h. There was no decrease in ATP levels at 5 μM PCP. Exposure of NK cells to 5 and 2.5 μM PCP for 48 h decreased ATP by 32% and 12%, respectively. Exposure to 10 μM PCP for 24 h decreased lytic function by 69%, while exposure to 5 μM PCP for 24 h decreased lytic function by about 45% and by 90% after 48 h. These data indicate that PCP exposure is able to decrease ATP levels in NK cells but that significant decreases in cytotoxic function occur even when there is no decrease in ATP levels. The addition of 1 mM antioxidant was unable to prevent the PCP-induced decreases in ATP levels or lytic function.

CAENORHABDITIS ELEGANS IMMUNE PATHWAYS IN DEFENSE AGAINST STREPTOCOCCUS PNEUMONIAE. *Stephen May and Nick Ragsdale, Belmont University, Nashville, Tennessee.* *Streptococcus pneumoniae* is the leading pathogen among bacteria that have a vaccine for treatment. The virulence factors for *Streptococcus pneumoniae* allow for it to infect humans. Several organisms respond to these virulence factors by inducing programmed cell death (PCD). A *C. elegans* model explored PCD as a possible defense mechanism. Additionally, this model was utilized to investigate the possible connection between the p-38 MAPK signaling pathway and PCD. PCD provided protection against *S. pneumoniae* infection and evidence suggested a link between the signaling and cell death pathways.

ARE GERMS MUSCLING THEIR WAY INTO YOUR GYM? MEASURING THE INCIDENCE OF METHICILLIN RESISTANT STAPHYLOCOCCUS AUREUS IN HIGH SCHOOL ATHLETIC FACILITIES. *Ellisa Carter, Elizabeth A. Delaney, Allie E. Thomas, and Perry M. Scanlan, Austin Peay State University, Clarksville, Tennessee.* Much of the research surrounding methicillin resistant *Staphylococcus aureus* (MRSA) prevention and identification centers on controlling and identifying human carriers of the bacteria. Hospitals employ several methods to detect the drug resistant bacteria in their primary care providers and patients. Recent outbreaks of MRSA in several Middle Tennessee high schools, particularly athletes, highlight the need to detect and control MRSA transmission from athletic equipment and facilities with fewer infection control mechanisms than hospitals. While most infections are

believed to be acquired as nosocomial infections in hospitals, community acquired MRSA can be involved in the spread of methicillin resistant bacteria. Generally it is thought to spread via direct contact through sharing or towels or equipment. Our findings support athletic equipment and the environment as reservoirs for MRSA. Despite schools frequent disinfection, assigning every player their own equipment, and requiring daily laundering of uniforms and towels, this does not appear to be effective in eradicating the bacteria from the environment. For this study, microbial samples were collected from several local high schools athletic facilities during the sports seasons. Athletic equipment, locker rooms, and training rooms were screened for the MRSA bacteria. Despite the best housekeeping efforts, MRSA was detected at every participating school. This study indicates that more effort should be spent on appropriately cleaning the facilities and equipment to prevent infection.

BIODEGRADATION OF POLYTERPENES BY MICROORGANISMS. *Michelle C. Lowe and S.K. Ballal, Tennessee Technological University, Cookeville, Tennessee.* Latex, a suspension of diverse, colloidal particles in liquid, can be found in specific cells (laticifers) in a large variety of plant species. Two well-known examples of plant families possessing laticifers are Apocynaceae and Euphorbiaceae. The composition of latex is highly variable, but generally consists of a number of secondary metabolites, which cannot participate further in cell metabolism. Today most chewing gums are made with synthetic gum bases; however, there are certain gums still available on the market that are made from chicle, a latex extracted from the trunk of *Manilkara zapota*, more commonly known as the Sapodilla Tree. This rubbery latex is known to consist largely of polyterpenes, compounds rich in double bonds. Commonly, compounds containing double bonds (alkenes) can be oxidatively cleaved into carbonyl fragments by reagents such as ozone, which attack ethylenic linkages. Oxygenase enzymes, found in certain bacteria and fungi, are also known to cleave double bonds in a similar manner. It was therefore hypothesized that the treatment of Chicle Chewing Gum (a gum known to be made from chicle obtained from the Sapodilla Tree) with natural producers of oxygenase would degrade the gum. In this experiment, the gum was exposed to the common soil bacteria, *Pseudomonas aeruginosa*, which produces oxygenase enzymes. The gum was placed on a lawn of *Pseudomonas aeruginosa* in Petri dishes for various lengths of time at the same temperature. The degradation is slow and inconclusive, and the experiment must be extended for longer periods.

EXAMINATION OF AFRICAN PLANTS TO DETERMINE THEIR CAPABILITY OF ANTI-BACTERIAL ACTIVITIES. *Faryal Farrukh and E. Lewis Myles, Tennessee State University Nashville, Tennessee.* It is possible that more than one-third of the world population is or will be infected by bacterial pathogens. Two million fatalities occur per year from bacterial infections. New infections caused by drug-resistant strains of *Mycobacterium tuberculosis* range from 0 to 57% (with a median of 10.2%). New infections caused by multi-drug resistant (MDR) forms of *M. tuberculosis* range from 0 to 14.2%, (median 1.1%). Patients undergoing re-treatment harbor MDR strains at a 7% median incidence, yet the existing pipeline of anti-*M. tuberculosis* agents are weak. Our research is studying the effect of crude extracts from Nigeria on pathogenic bacteria. The bacteria are exposed to the extract for 15, 30 and 60 minutes. Their colony

growth after exposure is used to determine the effects of the crude extracts from the Nigerian plants.

ANTI-MICROBIAL EFFECTS OF GREEN AND BLACK TEAS ON *SALMONELLA TYPHIMURIUM* AND *BACILLUS SUBTILIS*. *Jonathan Marner, Danaka J. Hancock, Todd Gary, and E. Lewis Myles, Tennessee State University Nashville, Tennessee.* Many teas are traditional drinks for health or mere enjoyment. The current investigation involves the examination of crude extracts of green and black teas on two pathogenic bacteria: *Salmonella typhimurium* and *Bacillus subtilis*. Methanol extraction gave us the crude extract. Evaporation of the methanol, with a rotary evaporator made it possible to determine the actual weights of the crude extract. We dissolved the crude extract in DMSO (Dimethyl Sulfoximide). The bacteria exposure periods were 15, 30 and 60 minutes. The bacteria grew on solid media and incubated for 24 hours. Bacterial colonies counts determined if any inhibition occurred. The results show that green tea inhibited growth more than black tea.

STUDYING DNA POLYMERASE COMPLEX OF SMALLPOX VIRUS. *Sarah Brandt, Debasish Chattopadhyay (UAB) and Nick Ragsdale, Belmont University, Nashville, Tennessee.* Smallpox still poses a deadly threat to people throughout the world. There is no effective treatment for smallpox. Viral replication is an obvious target for therapeutic intervention. Poxviruses replicate in the host cytoplasm using a processive polymerase complex composed of several viral proteins. In order to further the progress towards finding a cure for smallpox virus, we have expressed and purified A20, an essential protein found in the processivity factor of smallpox virus and examined its interaction with Uracil-DNA glycolylase (UDG), another essential protein found in the processivity factor. Knowledge of this complex can potentially lead to the development of tools to disrupt the polymerase complex and thereby inhibit viral replication.

OCCURRENCE OF METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* (MRSA) IN BELMONT UNIVERSITY ATHLETIC FACILITIES. *Brittany Myers and Jennifer T. Thomas, Belmont University, Nashville, Tennessee.* *Staphylococcus aureus* (*S. aureus*) is a gram positive, cocci-shaped bacterium that appears as "grape-like" clusters under the microscope. It can be carried on the skin or in the nose of healthy people and is not typically associated with disease. However, *S. aureus* can be associated with serious skin infections if introduced into a cut or lesion of the skin. In recent years, some *S. aureus* bacteria have gained resistance to antibiotics such as methicillin, creating methicillin-resistant *Staphylococcus aureus* (MRSA). While MRSA is common in hospital settings, this "superbug" has recently found a home in schools around the country (including middle Tennessee), especially around athletics facilities and equipment. Given this increasing concern for MRSA in community settings, I chose to examine the athletic facilities at Belmont University to determine the occurrence of *S. aureus* isolates and to establish how many of the isolates are MRSA. Samples were obtained from 8 sites on campus, with 3 areas swabbed from each site for a total of 24 samples. *S. aureus* isolates were confirmed by mannitol fermentation and gram staining. A total of 134 *S. aureus* colonies were identified, with the Beaman Women's Locker Room containing the most (63). Resistance of isolates to methicillin was measured using the disc diffusion method. A total of 10 MRSA colonies were found, with

the Beaman Women's Locker Room containing the most (9). These results indicate the presence of MRSA isolates in Belmont's athletic facilities and suggest a need for awareness and caution in the athletics department.

OCCURRENCE OF METHICILLIN-RESISTANCE STAPHYLOCOCCUS AUREUS IN HOSPITALS AND RESTAURANTS. *Kelienne M. Verdier and Jennifer T. Thomas, Belmont University, Nashville, Tennessee.* *Staphylococcus aureus* (*S. aureus*) is a gram-positive bacterium commonly found on the skin and in the nose of people and animals. It and its toxins are associated with many diseases including skin infections, pneumonia, toxic-shock syndrome, and food poisoning. Of recent concern is the increase in the incidence of methicillin-resistant *S. aureus*, MRSA, which is a type of *S. aureus* that is resistant to the antibiotic, methicillin. Methicillin is in the same family of antibiotics as penicillin and amoxicillin. MRSA has traditionally been one of the leading causes of nosocomial (hospital-acquired) infections, but has most recently been associated with infections in other settings. These "community-associated" infections usually appear as skin infections, but are extremely difficult to treat and may lead to more serious complications. Because of the increase of MRSA in community settings, I chose to examine the occurrence of MRSA in restaurants compared to hospitals. *S. aureus* isolates were collected from five hospital and five restaurant lobbies in the Nashville area and confirmed by gram staining and mannitol fermentation. Resistance to methicillin was tested with the disc diffusion method. We found many isolates of *S. aureus* in all hospitals and restaurants tested, however only hospitals had evidence of MRSA. The number of MRSA isolates in hospitals ranged from 1 to 12, confirming the concern for hospital-acquired infections. Importantly, the incidence of MRSA in restaurants does not appear to be a problem based on our samples.

THE EFFECTS OF CELLULAR PHONE CONVERSATIONS ON GAIT CHARACTERISTICS OF YOUNG ADULTS. *Tara L. McDonough, C. Steven Murphree, and Nancy S. Darr, Belmont University, Nashville, Tennessee.* Cellular phones are an important part of today's society. While there are many advantages to this wireless communication device, research has shown that the use of cell phones can become a distraction which compromises safety particularly while driving a vehicle. The purpose of this study was to examine the effects of two different types of cellular phone conversations on gait characteristics and gait safety while walking. Thirty healthy young adults participated in this study. Subjects' gait characteristics were measured as they walked across a GaitRite® mat under the three following conditions: 1. without a cellular phone, 2. engaged in a social conversation on a cellular phone, and 3. engaged in a conversation which involved solving arithmetic equations over a cellular phone. The math equations were used to simulate a more engaging and attention demanding conversation. Afterwards, the subjects filled out questionnaires which investigated cell phone use and its social and health related consequences. Results obtained by data analysis of the gait characteristics showed that velocity, cadence, step length, and stride length were significantly reduced and step time was significantly increased when using a cellular phone as compared with the control condition. This supports the conclusion that talking on a cellular phone while walking reduces gait safety and caution is suggested.

EFFECT OF 6-HYDROXYDOPAMINE TREATMENT ON DJ-1 AND PARKIN PROTEIN LEVELS IN CAENORHABDITIS ELEGANS. *Jennifer Rix and Nick Ragsdale, Belmont University, Nashville, Tennessee.* Previous studies have shown that there are increases in the protein levels of both DJ-1 and parkin proteins levels in patients with neurodegenerative diseases such as Parkinson's Disease. These proteins are often found in clumps of proteins referred to as Lewey Bodies. Additionally, over-expression of these and other proteins results in motor deficits in *C. elegans*. This study investigates the impact of the neurotoxin 6 hydroxydopamine on the expression of DJ-1 and parkin proteins. It is expected that these proteins will increase. These results will give insight into the potential role of environmental toxins in causing neurodegenerative diseases

CONFIRMING CHARACTERISTICS OF 6-OHDA TREATMENT IN CAENORHABDITIS ELEGANS. *Chelsea Wilson and Nick Ragsdale, Belmont University, Nashville, Tennessee.* Parkinson's disease is a neurodegenerative disease characterized by the death of dopamine neurons in the substantia nigra pars compacta of the brain. While environmental toxin exposure, increased generation of reactive oxygen species, and inhibition of mitochondrial electron transport is the current hypothesis, the mechanisms of dopamine neuron degeneration and increase in the production of reactive oxygen species in Parkinson's disease is unknown. *Caenorhabditis elegans* serves as a good model system for the degeneration of dopaminergic neurons because of high conservation between nematodes and vertebrates. The effects of 6-hydroxydopamine on treated and control *C. elegans* have been characterized regarding egg laying, mean velocity, and centroid velocity. This current work research is interested in examining the effects of 6-OHDA in the F₂ generation.

THE EFFECTS OF CAFFEINE ON LEARNING IN ZEBRAFISH, DANIO RERIO. *Adam Gilliland and Lori L. McGrew, Belmont University, Nashville, Tennessee.* Zebrafish (*Danio rerio*) have long been used as a model organism in cellular and developmental biology. Recently, researchers have begun to study zebrafish behaviors. A number of experiments have characterized the effects that certain drugs have on zebrafish embryos. Caffeine, however, has not been studied in zebrafish. Considering the prevalence of caffeine in America, and its potential to increase attention and focus in humans, it is a logical step to determine whether caffeine can facilitate learning in zebrafish. Fifteen wild-type zebrafish were given varying doses of caffeine, ranging from 0 mg/L to 10 mg/L. The fish were then tested using a rapid conditioning paradigm, to see whether the caffeine affected their learning ability in regards to avoiding a negative reinforcement. The results suggest that caffeine did not affect the learning ability of the zebrafish. The doses of caffeine may have been too high based on physiological changes in the fish.

THE EFFECTS OF PIGMENT PATTERNS ON SOCIALIZATION IN ZEBRAFISH, DANIO RERIO. *Michelle Howell Young and Lori L. McGrew, Belmont University, Nashville, Tennessee.* Zebrafish, *Danio rerio*, are a well established model organism for molecular and developmental biological research; yet are still a relatively new model organism in the study of behavior. Zebrafish exhibit a variety of social behaviors, many of which appear to be consistent within the species, including shoaling and mating. However, within a shoal, individual differentiation can

be observed, including individual tendencies towards aggression, submission, hyper-activity, or hypo-activity. There may also be phenotype specific behavioral divergence found among the various mutant lines of zebrafish. Ideally, with a better understanding of the differences in behavior, correlations with molecular or developmental changes may enable us to identify the genes responsible for these differences. Because of the availability of mutants and elucidated gene-linkage, zebrafish offer opportunities to study the biological determinants of behavior. To this end, we are characterizing behavior in different phenotypes of *Danio rerio* in a laboratory setting. The phenotypes studied were represented by variant mutational pigment patterning including the iridescent pearl *Danio*, the spotted leopard *Danio*, and striped wild-type *Danio*. Individual social discrimination tests were conducted between native and alternate phenotypes in order to characterize individual social preferences based on the role of visual cues for shoal interactions.

NICOTINE FACILITATES LEARNING IN ZEBRAFISH, *DANIO RERIO*. *Rebecca L. Repasky and Lori L. McGrew, Belmont University, Nashville, Tennessee.* Losses in memory have been a devastating reality for millions of Americans, especially with modern increases in age and the onset of neurodegenerative diseases such as Alzheimer's disease. Studies have shown that in many model systems, nicotine increases memory. A recent addition to the group of standard models is the zebrafish *Danio rerio*, a small fish used traditionally in the studies of developmental biology and genetics. In our study, the fish were tested using a rapid-conditioning test to observe learning of side-preference in a tank. Previous studies used the salt nicotine ditartrate in their tests; however, in order to standardize results, this study used pure nicotine. Results revealed a dose-dependent curve, with optimum concentrations providing higher learning than control fish showed. We also determined that long-term exposure to nicotine produced results no different from fish not exposed to nicotine, suggesting the development of tolerance to the chronic presence of nicotine.

ROLE OF SEROTONIN IN CAFFEINE-INDUCED LOCOMOTORY CHANGES IN *CAENORHABDITIS ELEGANS*. *Jelena Stupar and Lori L. McGrew, Belmont University, Nashville, Tennessee.* Caffeine is one of the most commonly used addictive substances among humans. However, there are relatively few studies demonstrating how caffeine affects humans. Consumption of caffeine, results in desensitization to endogenous neurotransmitters, creating dependence. Caffeine affects a number of neural pathways in humans, and this complexity makes it difficult to determine the exact mechanism of action. *C. elegans* are a simple model system that makes examining neurological pathways easier and demonstrates similarity to the neurological pathways in humans and other animals. Previous studies have demonstrated that caffeine works as an adenosine receptor antagonist and inhibits its ability to bind to adenosine, thereby affecting adenosine-modulated serotonin release. Based upon this and the role of adenosine in *C. elegans*, we predicted that caffeine would affect locomotion and chemotaxis in the nematodes. We used image capture and analysis software to characterize movement in worms treated with caffeine and compared them to untreated controls.

THE EFFICACY OF SELECTED OVER-THE-COUNTER CHEMICAL REPELLENTS AGAINST *Aedes aegypti* IN

HUMAN VOLUNTEER LABORATORY ASSAYS. *Cori Pedigo and Steve Murphree, Belmont University, Nashville, Tennessee.* Commercially available insect repellents can be divided into two categories: synthetic chemicals and plant-derived essential oils. The most effective synthetic chemical repellents include DEET, IR3535 and Picaridin. Efficacies of the commercially available repellents Repel[®] Sportsmen Formula[®] Insect Repellent, Repel[®] Insect Repellent, Skin so Soft[®] Bug Guard plus IR3535 and Skin so Soft[®] Bug Guard plus Picaridin were evaluated. Duration of protection by each product was tested with arm-in-cage studies, in which volunteers inserted their repellent-treated arms into a cage with a fixed number of unfed female *Aedes aegypti* mosquitoes, and the elapsed time to first landing/probing was recorded. The Skin so Soft[®] Bug Guard plus Picaridin efficacy seems to be gender related in this study. The repellents containing increasingly higher amounts of DEET were the most efficacious in terms of protection times.

IMPLICATIONS FOR USING THE ACT FOR COLLEGE ADMISSION. *Martha W. Stratton, Tennessee State University, Nashville, Tennessee.* Data collected seem to support the contention that the ACT is a valuable instrument for assessing the eligibility of students for college admission. Standardized assessments like the ACT are not only used for college admission, they're also used to determine who gets various scholarships to attend college. The fact that the ACT is used as an admission criterion impacts the college pool for many universities each year, which makes the process very competitive. If students do not perform well on this exam they will not gain entrance to an institution of higher education. For some students this denies them their "rights of passage" from high school therefore, professional and/or career opportunities also. The ACT does provide educators at the high school and college levels with an instrument to assess the readiness of students who aspire for college admission however, it can also help them address and implement strategies to enhance student aspirations.

CHARACTERIZATION OF "SHRINKER" MUTANTS IN *CAENORHABDITIS ELEGANS*. *Bethany N. Woodard and Lori L. McGrew, Belmont University, Nashville, Tennessee.* This study utilized the nematode, *Caenorhabditis elegans*, a widely used model organism in neuroscience. A wild-type strain, N2, and two mutant strains, *unc-46* and *unc-25* were characterized. The mutant strains have a shrinker phenotype which is caused by a mutation in GABA receptors. Shrinker worms are shorter than wildtype worms and cannot move effectively; they lack sinusoidal movement. In collaboration with the computer science department, we have used image capture and analysis to evaluate movement deficits in these mutants. Following characterization of the animals, we treated the nematodes with muscimol (a GABA receptor agonist) and α -alanine (a GABA transporter blocker) and evaluated the efficacy of these agents to restore wildtype function. The untreated *unc-46* mutant worms showed statistically significant differences in length when compared to N2 worms. Following treatment with muscimol, the *unc-46* mutants showed a significant increase in length. α -alanine however, had no significant effect on the mutant worms.

A COMPARISON OF VISUAL VERSUS OLFACTORY CUES FOR MATE SELECTION IN ZEBRAFISH, *DANIO RERIO*. *Zachary W. Cavo and Lori L. McGrew, Belmont University, Nashville, Tennessee.* The aim of this study is to gain a more

detailed understanding of mating cues observed in *Danio rerio*, zebrafish, specifically visual and olfactory cues. Previous studies have shown that courtship behaviors may be induced by different cues including chemosensory, olfactory, and visual cues. However, few studies have been done on the different roles of these cues and the effects they have on males. Other studies also show that pheromones are responsible for kin recognition among zebrafish. This study examines the role of these cues in mate selection among zebrafish by using three different phenotypes (striped, leopard and pearl), to determine whether there is a preference based on the phenotype of the fish exhibiting the cue. This study may demonstrate the importance of visual and olfactory cues in both initiating a mating response (recorded by male courtship behavior) as well as the final outcome of mating (measured by egg production).

THE EFFICACY OF SELECTED BOTANICALLY-DERIVED BIOREPELLENTS AGAINST *Aedes aegypti* IN HUMAN VOLUNTEER LABORATORY ASSAYS. **Melissa J. Draper and Steve Murphree**, Belmont University, Nashville, Tennessee. Commercially available insect repellents can be divided into two categories: synthetic chemicals and plant-derived essential oils. Previous research indicates that the most effective natural plant-based repellents involve a mixture of essential oils, such as oil of lemon eucalyptus, citronella oil, geraniol oil, soybean oil, coconut oil, neem oil, and a combination of catnip and Osage orange, combined in an oil base. Efficacies of the commercially available repellents Bite Blocker®, Burt's Bees Insect Repellent®, Bug Band®, and Buzz Away®, were evaluated in this study. Duration of protection by each product was tested with arm-in-cage studies, in which volunteers inserted their repellent-treated arms into a cage with a fixed number of unfed female *Aedes aegypti* mosquitoes, and the elapsed time to first landing/probing was recorded. Time of landing varied among the volunteers depending on their individual attractivity to the mosquitoes in addition to the effectiveness of the repellent. Correlation of the efficacy of repellents between male and female subjects was inconclusive, although significant difference of efficacy among the four repellents was found.

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ON THE ROLE OF STOP CODONS AND EVOLUTION. **Tit-Yee Wong**, University of Memphis, Memphis, Tennessee. A new method was developed for phylogeny analysis. This method was based on the theory of genome expansion by partial gene duplications and the limitations imposed on gene elongation by the numbers of types of premature stop codons on the gene sequences. Each chromosome was designated by a series of scalars, termed Cistronic Stop Ratio Series (CSRS), representing the ratio of distributions of stop sequences in each on the 3 reading frames of all cistrons in a genome. Distance correlation analysis by comparing the CSRS values of 80 bacterial chromosomes, 7 archaea chromosomes, 11 mammalian mitochondrial genomes, and 15 chloroplast genomes showed that this data-rich and unbiased method of whole genome approach

would produce phylogenetic trees similar to most commonly accepted phylogenetic trees. Results also supported the theory of genome evolution by partial gene duplication.

MONTANE RAINFOREST BIOGEOGRAPHY: GEOGRAPHY'S EFFECTS ON ARBOREAL SIZE AND DISTRIBUTION. **Dustin Long**, Rhodes College, Memphis, Tennessee. The evergreen tree *Ocotea usambarensis* (family Lauraceae) was surveyed for abundance and size over 18 days in November 2007 in the Mazumbai Forest Reserve in Northern Tanzania. These data allowed me to determine the effects of geographic heterogeneity at macro and micro-spatial scales on arboreal size and distribution. An altitudinal preference was evident at the macro-scale. At the micro-scale, local topography significantly influenced size, while both undulation shape and slope were significantly correlated with abundance, implicating a geographic determinant at this scale on arboreal size and distribution. The entire sampled population was found to be clumped, a result of the combined effects of microsite selection and seed predation. This study indicates the capacity of purely geographic factors to maintain non-uniformity in the forest through the creation of species-specific preferred microsites. This mechanism of spatial heterogeneity acting in multiple scales contributes to diversity of species.

MORPHOLOGICAL AND MOLECULAR ANALYSIS OF AN INVASIVE SPECIES, *Corbicula*. **Stephanie Juchs**, Rhodes College, Memphis, Tennessee. Freshwater clams of the genus *Corbicula* include several invasive species, as also called Asiatic clams. Spread across the continent since initial introduction in 1924, many of these Asiatic species have been identified through strictly morphologic study. Genetic analysis of the mitochondrial cytochrome c oxidase subunit I gene (COI), however, allows for more exact and consistent differentiation of the species within the *Corbicula* genus. Populations of *Corbicula* from two Wolf River (Fayette County, TN) locations were analyzed morphologically and genetically for identification as either *C. fluminea* or the closely related *C. fluminalis*. Morphological analysis included investigating the ratio of three morphometric variables, while the genetic data relied on restriction fragment length polymorphism analysis through the digestion of the mitochondrial sequences of the COI gene. While morphological measurements were inconclusive for identifying samples as *C. fluminea* or *C. fluminalis*, genetic data strongly suggests individuals from the Wolf River to be *C. fluminea*.

ROOSTING HABITS OF TWO SPECIES OF BATS IN WESTERN TENNESSEE. **John Lawson, Brian D. Carver, Stevie Bell, Dustin Dickey, Kyle McInnis, and Tristan McPherson**. Freed-Hardeman University, Henderson, Tennessee. Rafinesque's big-eared bats (*Corynorhinus rafinesquii*) and southeastern myotis (*Myotis austroriparius*) are listed (informally) by the U.S. Fish and Wildlife Service as species of management concern. Very little data exist on use of natural tree roosts of these species. Our study was designed to describe patterns of day roost use by these two species. Radio transmitters were attached to adult females of both species to aid in locating new roost structures. Thirty-three roost trees were identified, with most being large hollow water tupelos (*Nyssa aquatica*). Roost trees were checked twice weekly during the fall of 2007 for the presence of roosting bats. An average of forty percent of the roost trees was occupied each day, and frequent roost switching was observed. The results of our

study suggest that the roost structures in our study area are relatively permanent, but they are likely not widely available across the landscape.

MORPHOLOGICAL AND GENETIC ANALYSIS OF 118TNE MUTANT MICE. *Jason Porter, Jian Zuo, Jiangang Gao, and Tianhe Zhang, Christian Brothers University, Memphis, Tennessee (JP), and St Jude Children's Research Hospital, Memphis, Tennessee (JZ, JG, TZ).* High frequency hearing loss (HFHL) is a common hearing deficiency in humans. To better understand HFHL, here we analyze cochlear morphology of the mutant mouse 118TNE, which was generated in an N-ethyl-N-nitrosourea (ENU)-neuromutagenesis and exhibits a phenotype similar to HFHL in humans. Atrophy of spiral ganglion neurons causes 118TNE mice to have significant hearing deficits at high frequencies (16 and 32 kHz). To localize the anomaly responsible for the spiral ganglion degeneration, we used MIT markers to conduct a genome scan. Emphasis was directed at chromosome 15, the target chromosome in the mutagenesis scheme. We examined the onset of pathology, and showed that while original morphological analysis was conducted at 8–11 weeks of age, degeneration continues to progress with time. Our study will hopefully lead to the identification of the mutant gene responsible for the HFHL and enhance our understanding of the pathophysiology of such disorders in humans.

CHANGES IN GIANT PANDA PROGESTERONE LEVELS AND THEIR CORRELATION TO REPRODUCTIVE MATURITY. *Nhu Truc Le, Rachel Hansen, and Andy Kouba, Christian Brothers University, Memphis, Tennessee (NTL), and Conservation Department, The Memphis Zoo, Memphis, Tennessee (RH, AK).* With approximately 1600 individuals in the wild, the giant panda has been classified as an endangered species. Reproductive research plays an important role in their survival and propagation in captivity. Since 2003, the Memphis Zoo has been invested in research to reproduce the giant panda in captivity. Hormonal studies, especially in regards to progesterone and estrogen, have provided an excellent tool for researchers. A detailed understanding of the hormonal changes occurring in a female giant panda during estrus allows an accurate assessment of when ovulation occurs. This in turn, increases the odds of pregnancy following breeding seasons. Levels of progesterone were analyzed by immunoassay following estrus. We found that as the subject became reproductively mature, her progesterone levels increased. A successful artificial insemination was conducted in 2007 after the female experience her highest estrus hormone levels. It is possible that a weak estrus is a reason for reproductive failure following estrus.

GUT MOTILITY AND GASTROINTESTINAL MIXING IN THE GIANT PANDA (*AILUROPODA MELANOLEUCA*). *Eric A. Davis and Rachel Hansen, Christian Brothers University, Memphis, Tennessee, and Conservation Department, The Memphis Zoo, Memphis, Tennessee.* The purpose of this study was to understand the extent of axial mixing in the gastrointestinal tract of the giant panda (*Ailuropoda melanoleuca*). Fecal passage rate and the percentage of intestinal mixing were determined by using colored corn as an innate marker. The male panda had a passage rate of 6.98 ± 1.00 hours, and the female's passage rate was 6.50 ± 1.67 hours. Both animals showed significant evidence of axial intestinal mixing, with the male panda demonstrating a greater percentage of evidential mixing. A comparative study of an additional member of the Ursid family, the omnivorous

American black bear, was used to compare passage rate findings. The American black bear studied had an average passage rate of 8.68 ± 0.77 hours.

HABITAT HETEROGENEITY AND SPECIES RICHNESS: IS THERE A RELATIONSHIP?. *J. Erin Fender and Michael L. Kennedy, University of Memphis, Memphis, Tennessee.* The prediction that habitat heterogeneity and species richness are associated was tested with small mammals at the point and local scales in the tropical dry-forest region of Colima, Mexico. This location was sampled during winters of 2003–2007. Sampling was conducted on 25 trapping grids each with 100 grid stations consisting of arboreal and ground-level traps using a 10 m × 10 m design at each level. Results are based on 35,000 trap-nights. Species richness at each spatial scale was examined in relation to 14 habitat variables, representing vertical and horizontal structural components, taken at each grid station. Data were examined using correlation and regression analyses. Results reflected the occurrence of 18 species in the study region. Species richness was associated with select vertical and horizontal habitat features, but these varied with scale. Our results demonstrate that spatial scale is a factor in understanding habitat heterogeneity and species richness associations.

AN ASSESSMENT OF POPULATION DENSITY OF WHITE-TAILED DEER (*ODOCOILEUS VIRGINIANUS*) IN WESTERN TENNESSEE. *Jeremy S. Dennison, University of Memphis, Memphis, Tennessee.* Population density of white-tailed deer (*Odocoileus virginianus*) was studied at the Milan Army Ammunition Plant in Carroll and Gibson counties in western Tennessee during September 2007. The investigation utilized infrared-triggered cameras on a 4 × 5 grid with 20 quadrants measuring 60.7 ha (150 acres) each. A single camera was placed at the center point of each quadrant. Center points were determined utilizing a GPS unit. From previous studies of home range of white-tailed deer, total area of effect was determined as 1,439 ha (3,550 acres). Density was determined from photographs. Results indicated a pre-hunt density of 1 deer per 6.3 ha (15.5 acres). Results are discussed in light of previous estimates of abundance at this site.

3-DIMENSIONAL ANATOMICAL SOFTWARE IN TEACHING GROSS ANATOMY FOR HEALTH PROFESSIONAL STUDENTS. *Courtney B. Langston, Nic Pierce, Eldridge Johnson, Paul Madubuonwu, Andrea Elberger, Kathy Gibbs, and Becky Saulters, The University of Tennessee Health Science Center, Memphis, Tennessee.* The traditional approach of teaching gross anatomy as a formal lecture and gross dissection composite has been challenged. The purpose of this proposal was to devise and implement a modern strategy to improve the traditional didactic and laboratory dissection method of teaching human gross anatomy to health science students. A pilot study was undertaken to determine the feasibility of using three-dimensional anatomical software as a teaching tool. All students were given faculty guided demonstrations of the 3-D anatomical software and were requested to fill out a survey concerning their opinion of the usefulness of this type of teaching. The results indicated that all 13 dental students thought that it was very useful (rating of 5); of the 23 medical students participants, 19 reported that it was very useful (rating 5) and four gave it a useful score (rating 4); three physical therapy students expressing that it was somewhat useful (rating of 3).

THE EFFECTS OF SEATING ARRANGEMENT ON INTERACTION IN THE CLASSROOM. *Brettjet L. Cody, University of Memphis, Memphis, Tennessee.* Research suggests that peer interaction in the classroom promotes academic achievement. The purpose of this study was to investigate the effect of seating arrangement on classroom interaction. Undergraduate students participated in small discussion groups arranged in one of two seating arrangements: row-and-column or circular. Analysis revealed that peer-to-peer comments were higher in the circular formation, although the difference was not statistically significant. However, participants seated in the row-and-column formation directed more comments to the moderator than did those in the circular formation. These findings emphasize the potential importance of seating arrangement on classroom interaction.

PERINATAL PERIODS OF RISK AND INFANT MORTALITY IN MEMPHIS, TN. *Sami Helou and Kathrin Brown, Christian Brothers University, Memphis, Tennessee, and Memphis and Shelby County Health Department, Memphis, Tennessee.* The infant mortality rate (IMR) in Memphis, TN is among the highest in the nation. Risk factors for infant mortality include genetic syndromes and obstetric disorders. The Perinatal Periods of Risk (PPOR) approach was used to determine and rank contributing factors to infant mortality between African American infants and their Caucasian counterparts. The PPOR was used to map fetoinfant mortality by birth weight and gestational age and examine the highest period of risk for each race. Chi-square analysis was used to determine if there were significant differences in the periods of risk between each race. In Shelby County, the overall IMR from 2003–2005 was 13.5 deaths per 1,000 live births. The IMR of African Americans was 15.2 infant deaths per 1,000 live births with a statistically significant IMR during the period of risk targeting maternal health and prematurity.

CHARACTERIZING EFFECTS OF VHL OVER-EXPRESSION IN TRANSGENIC DROSOPHILA. *Angela D. Metz, Lawrence T. Reiter, and Tiffany N. Seagroves, Department of Biology, Christian Brothers University, Memphis, Tennessee (ADM), and University of Tennessee, Center for Cancer Research, Memphis, Tennessee (LTR, TNS).* Von Hippel-Lindau (VHL) disease causes highly vascularized tumors in the central nervous system (CNS), retina and kidney resulting from mutations in *VHL*, a tumor suppressor gene. It is well-established that VHL (pVHL) regulates the protein stability of the transcription factor Hypoxia-Inducible Factor (HIF)-1 α through proteolysis. However, identification of additional pVHL targets besides the HIF-1 α subunits is necessary to understand the cellular role of pVHL and to develop treatments for VHL patients. Since there are orthologs for *VHL* and *HIF-1 α* in *Drosophila*, (*dVHL*; *sima*), we characterized transgenic flies that over-express *VHL* or *dVHL* for defects in nervous system or tracheal development during embryogenesis. Embryos were stained with markers to the CNS, peripheral nervous system or trachea lumen and patterns were compared to controls. No gross differences in staining were observed. Therefore, the *Btl*-Gal4 and *C155*-Gal4 drivers used to achieve *VHL/dVHL* over-expression cannot be used to visually score for defects resulting from over-expression of *VHL/dVHL*, and additional embryonic tissues must be tested in the future.

PARA^{TS} MUTANT FLIES SHOW NEURONAL DAMAGE AFTER ISCHEMIC INJURY. *Rebecca Scott, William Pulucenilli, and Lawrence Reiter, Christian Brothers University, Mem-*

phis, Tennessee (RS), and University of Tennessee Health Science Center, Memphis, Tennessee (WP, LR). Ischemia is a condition caused by the restriction of blood flow to important tissues such as the heart, kidneys and the brain. *Drosophila* share basic neuronal similarity to humans and contain a large number of orthologous genes. By developing a *Drosophila* model to mimic ischemia, it may be possible to decipher the molecular mechanisms of neuronal cell death after ischemic injury. *Drosophila para^{TS}* flies are temperature sensitive mutants that undergo instant paralysis causing their heart to stop and restricting hemolymph to the brain when placed at temperatures > 22°C. Heat-shocked *para^{TS}* fly brains and wild type flies were sectioned and stained using Hematoxylin and Eosin. This staining revealed a slight reduction in nuclei size, indicative of cell death due to ischemic injury in the mutant fly brain compared with the wild type. This is the first step in the construction of a fly ischemia model.

THE IMPORTANCE OF PARASYMPATHETIC REGULATION OF CHOROICAL BLOOD FLOW FOR CONE PHOTORECEPTOR HEALTH IN PIGEONS. *Casey C. Nazor, Anton J. Reiner, and Malinda E. C. Fitzgerald, Christian Brothers University, Memphis, Tennessee (CCN), and The University of Tennessee Health Science Center, Memphis, Tennessee (AJR, MECF).* We investigated the importance of parasympathetic control of choroidal blood flow (ChBF) for retinal cone photoreceptor health. Thirty-eight pigeons received either a lesion of the nucleus of Edinger-Westphal (EW) that impaired parasympathetic ChBF control and the pupil light reflex (PLR), or a lesion of area pretectalis (AP) that only impaired the PLR. Birds were then housed in either cyclic (12 h light/12 h dark) or constant light. After transcardial perfusion with fixative, eyes were removed, embedded in epoxy resin, sectioned, and mounted. Retinal images captured at 50 \times were used to measure cone outer segment width, using NIH Image J. EW-lesioned birds housed in constant light exhibited a 10–20% decrease in outer segment width across all cone types, but no change was observed in constant-light AP-lesioned birds or in birds housed in cyclic light. These findings suggest that EW plays a crucial role in maintaining retinal health in stressful light conditions.

SUCROSE INDUCED ANALGESIA IN THE BRAINSTEM OF NEONATAL RAT PUPS. *Indre Augustinaite, Matthew Ennis, and Yi-Hong Zhang, Christian Brothers University, Memphis, Tennessee (IA), and University of Tennessee Health Science Center, Memphis, Tennessee (ME, YHZ).* Previous studies show that nursing produces analgesia in neonatal humans and rats. Sugars in breast milk stimulate oral cavity sweet-responsive taste buds which triggers opioid release in the brain. The neural circuits mediating this analgesia are unknown. The goal of this study was to inactivate a key brain site involved in opioid analgesia, the rostral ventromedial medulla (RVM), to determine its role in analgesia produced by intraoral sucrose infusion in neonatal rats (ages P10–P13). Intraoral sucrose infusion produced analgesia as measured by hindpaw withdrawal responses to a series of von Frey filaments; i.e., sucrose increased the filament force needed to produce a withdrawal response. Sucrose analgesia was unaffected by microinjection of saline into RVM. By contrast, microinjection of the local anesthetic lidocaine into RVM eliminated sucrose-induced analgesia. As lidocaine suppresses neural activity, these findings indicate that sucrose-induced analgesia is mediated, at least in part, by the RVM.