

ABSTRACTS OF PAPERS PRESENTED AT THE SPRING 1999 COLLEGIATE MEETINGS

EASTERN REGION

THE UNIVERSITY OF TENNESSEE, CHATTANOOGA
CHATTANOOGA, TENNESSEE

RELATIVE FITNESS OF DISPERSING AND RESIDENT PINE VOLES *MICROTUS PINETORUM* IN DISTURBED HABITATS. **Xu Baogang, J. R. Hisey, M. W. Riley, and K. D. Shepard**, *Lee University, Cleveland, Tennessee*. The natural history of pine voles has been rarely studied outside the apple orchards upon which they exact such heavy economic tolls. Their dispersal behavior is particularly interesting because it determines whether migration barriers or pesticides are the most efficient means of control. Vole dispersal also is of evolutionary interest because it appears to be a strategy that lowers fitness, yet continues to appear at high frequencies in natural populations. We hypothesized that dispersal in pine vole compared to prairie voles in the same area would be rare. Pine voles populations should be more stable because their cooperative breeding system, more extensive burrows, and root and bark dominated diet would be less affected by disturbances to the surface vegetation. After testing these hypotheses during an eleven-month mark and recapture study, we found dispersal rates were indeed low. Population density varied, rising to a peak during the winter months.

EFFECTS OF LIPID COMPOSITION ON PHEROMONE RECEPTORS IN YEAST. **David Dismuke and Stephen Wright**, *Carson-Newman College, Jefferson City, Tennessee*. The yeast mating response relies upon the interaction of soluble pheromones with receptors on the cell surface. The receptor is a membrane protein with seven membrane spanning domains, which transmits information to G-proteins within the cells by undergoing a conformational change following pheromone binding. This G-protein coupled receptor is a prototype of a protein superfamily which has many examples in humans. Since the protein is embedded in the lipid bilayer of the membrane, it should be sensitive to its lipid environment. We have therefore undertaken studies to look at the effects of lipid composition on activity of this receptor in *Saccharomyces cerevisiae*. Cells that have had their lipid composition changed by media supplementation, drugs or mutation have an altered response to the pheromone a-factor than untreated cells. Binding of a-factor to membranes prepared from the cells indicate that these altered cells have an increased binding capacity but a decreased affinity for the pheromone.

RELATIVE SEX RATIOS OF *GAMBUSIA MANNI* IN SELECT BLUE HOLES OF SAN SALVADOR, BAHAMAS IN RELATIONSHIP TO ABSOLUTE LOCATION AND AMBIENT WATER CONDITIONS. **Erica Brandon, Steve Clement, and Joshua Pendergrass**, *The University of Tennessee, Chattanooga, Chattanooga, Tennessee, and The Bahamian Field Station, San Salvador, Bahamas*. *Gambusia manni* is the dominant spe-

cies of the interior brackish blue holes on San Salvador Island. Some of the blue holes selected for study were 7A, 7B, and 11. The objectives of the study were: 1) to measure some of the physical and chemical parameters of each site; 2) to determine the population size and the sex ratios of *G. manni*; 3) to determine fish species diversity of the study sites; and 4) to obtain Global Positioning System (GPS) "fixes" on each study site. The measured aquatic parameters were within normal limits for brackish water systems in all study sites. *G. manni* males make up 10.8 % of the populations studied, whereas females represented 24.7 % and the remainder are juveniles. Population diversity of the study sites included only four species of brackish water fishes. GPS data have been georeferenced to existing mapping of the island.

COMPARISON OF WETLANDS FORMATION WITH STANDARD CONSTRUCTION PRACTICES. **Walter Ferguson, John Killeffer, Tom Bowen, and John Beck**, *The University of Tennessee, Chattanooga, Chattanooga, Tennessee*. A delineation of a storm water detention pond in a vacant lot directly in front of Lowe's Hardware on Gunbarrell road in Chattanooga, Tennessee was performed as per Federal Standards. The methodology included a combination of routine, comprehensive, and atypical criteria as outlined in the United States Army Corps of Engineers (USACE) Wetland Delineation Manual. The purpose of this project was to draw direct comparisons between standard construction practices, and the presence of unintentionally created hydric zones, which defy the normal accepted definition for a wetland in characteristics and location. The objectives for the project were as follows: 1) delineation of the test site; 2) comparison to a control area to demonstrate that the test site exists outside the accepted parameters for the classical wetland description; and 3) a comparison of the test site delineation with a delineated wetland known as the Amnicola Marsh located in Chattanooga, Tennessee. The results of this study have shown that through a set pattern of physical alterations to a localized area, conditions for a hydric zone can be initiated.

LONGITUDINAL SECTION OF THE MISSIONARY RIDGE THRUST FAULT IN THE TENNESSEE SOUTHERN APPALACHIAN FOLD AND THRUST BELT. **Stephen Floyd, and Habte G. Churnet**, *The University of Tennessee, Chattanooga, Chattanooga, Tennessee*. The Missionary Ridge Thrust Fault (MRTF) is near the western part Tennessee Southern Appalachian Fold and Thrust Belt within the Valley and Ridge province. The broken zone of this thrust fault lies within the Middle Ordovician Chickamauga Limestone. A quarry developed by the Tennessee Valley Authority to construct the Chickamauga Dam, offers a longitudinal view of the MRTF, and a nearby road cut provides a profile view. At the quarry, the broken zone of the MRTF is about 200 feet thick. It is marked by slickenlines and offers a view of the terminations of small-scale plunging folds.

THE REGENERATION OF A DEAD CORAL REEF SYSTEM COMPARED TO A HEALTHY REEF SYSTEM. *Natalie Fisher, Todd Grant, John Ozbeck, and Amelia Poe, The University of Tennessee, Chattanooga, Chattanooga, Tennessee, and The Bahamian Field Station, San Salvador, Bahamas.* The purpose of this study was to compare a regenerating coral reef (Cemetery Reef, San Salvador Island) to a healthy coral reef (Dim Bay, San Salvador Island). The two sites were located on opposite sides of the Island and are considered to be patch reefs of the forereef type, i.e., both exist between the deep-water wall and the shoreline and are shallow water reefs. Each reef was mapped using the Global Positioning System and a compass. A third reef (Short Stop Reef) was completely catalogued as a control for comparative purposes. Biodiversity criteria consisted of coral species, "other" invertebrate species, and fish species present or absent at each test site. Results indicate that the coral species diversity is higher at Dim Bay, whereas the "other" invertebrate species diversity was richer at Cemetery Reef and the fish species diversity at the two reefs was similar.

A COMPARISON OF FISH AND ALGAL SPECIES ON A NATURAL REEF AND TWO ARTIFICIAL REEFS, SAN SALVADOR, BAHAMAS. *Brenda Lyle, Michael Chandler, Reagan Ritchie, and Matt Souther, The University of Tennessee, Chattanooga, Chattanooga, Tennessee, and The Bahamian Field Station, San Salvador, Bahamas.* A natural reef (Rocky Point) and two artificial reefs (Grahams Harbor) were surveyed for fish and macroalgae species. The purpose of this study was the differentiation in the biodiversity of the surveyed species found at the different sites. Results indicate that the subtidal Rocky Point reef and the intertidal artificial pipe reef in Grahams Harbor have similar biodiversity of those species studied. However, the subtidal artificial dock reef at Grahams Harbor had fewer species of both algae and fish than the other two study sites.

A WATER QUALITY SURVEY OF PANTHER CREEK: THE IMPACT OF HORSE TRAILS ON COLIFORM COUNTS. *Meredith McBride, Carson-Newman College, Jefferson City, Tennessee.* Increasing populations, industrial growth and pollution are causing water shortages throughout the world. Pollution in particular is a problem because clean water is necessary for almost every human endeavor. Specifically, contamination of water with fecal wastes presents problems for both man and the environment. Because water acts as a medium for carrying infectious diseases, many people are infected every year by consuming water tainted with fecal waste. Panther Creek is a spring fed stream located in Morristown, Tennessee. Because horse trails of Panther Creek State Park are contained within the watershed of Panther Creek, significant fecal bacteria may be contributed to the creek via runoff. As a result, a water quality survey of the coliform concentrations at Panther Creek was commenced on October 8, 1997. The data from the 14-month survey show that coliform counts downstream of the horse trail were significantly higher than counts of upstream sites. This suggests that the horse trail may be impacting the water quality of Panther Creek.

HSC-70: INDUCED EXPRESSION IN MAIZE AFTER THERMAL STRESS. *Katherine S. Redding, Tennessee Technological University, Cookeville, Tennessee.* A dot-blot immunoassay was developed to rapidly estimate the expression of the heat shock cognate protein, Hsc-70 in maize (*Zea mays* L.). Plants were

grown under controlled conditions (25°C, 18 h light: 6 h dark) for 4-5 weeks and then subjected to an acute thermal stress, of 30, 35, 40, or 45°C for 90 min. Leaf tissue from individual plants was sampled before (control) or immediately after the thermal stress. In another experiment, plants were sampled 0, 3, 16, and 24 h after the stress to evaluate recovery time. Thermal stress rapidly induced the expression of Hsc-70 above the level present in untreated control plants. Moreover, Hsc-70 remained elevated for at least 24 h after a 45°C heat shock.

MIDDLE REGION

AUSTIN PEAY STATE UNIVERSITY

CLARKSVILLE, TENNESSEE

CONTRIBUTORS TO THE GRAPEFRUIT JUICE EFFECT.

Kellie L. Wallace and R. H. McCoy, Austin Peay State University, Clarksville, Tennessee.*

USING THE SCANNING ELECTRON MICROSCOPE TO IDENTIFY HEAVY METALS IN THE HAIR OF STRIPED SKUNKS. *Luke West*, Kenny Smith, Hillman Mann, Nancy Morris, and Charles Snelling, Volunteer State Community College, Gallatin, Tennessee.* Road-killed skunks were collected in a specific area of Sumner County, Tennessee, between January and April 1999. Hair samples were obtained from each skunk. The samples were cleaned, and then examined for heavy metals by X-ray mapping with the Scanning Electron Microscope (SEM).

NUCLEOTIDE SEQUENCES OF STRESS TOLERANCE IN GLYCINE MAX. *Hugh Fentress*, D. Long, C. Caudle, and E. Lewis Myles, Tennessee State University, Nashville, Tennessee.*

The amount of economically usable products obtained from crop plants can be severely reduced under stressful environmental conditions. The two types of stresses being studied in our investigation are Metal toxicity (cadmium) and Drought stress. The present study will identify sensitive and tolerant plants as well as obtain more information on the genes that are responsible for the synthesis of metal binding proteins. The identification of Drought tolerant plants also would increase the efficiency of productivity in agricultural plants. The identification of genes involved in reducing water loss can be transfected into plants that are sensitive to extended drought periods. The present study examined four cultivars (Forrest, Suzuyakataya, Hutcheson, and Tomohomar) for their tolerance to cadmium and polyethylene glycol. Once the plants were screened for tolerance, Reverse Transcriptase-Polymerase Chain Reaction (RT-PCR) was performed to identify genes that are involved in their respective tolerance. At least two nucleotide sequences have been identified to metal tolerance.

EVALUATION OF CARDIAC MARKERS IN A CLINICAL SETTING. *Jennifer Shouse* and James Thompson, Austin Peay State University, Clarksville Tennessee.* Cardiac markers, such as CK-MB and Troponin I, play an important part in diagnosing Acute Myocardial Infarction (AMI) in patients. In the clinical laboratory it also is important to evaluate diagnostic

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markers, based on quality patient care, turnaround time, cost, and technician time. In a community hospital clinical laboratory, Troponin I and CK-MB Isoforms were compared to assess the feasibility of replacing CK-MB Isoforms with Troponin I as a marker for AMI. This concordance study yielded a 99 % agreement ratio between the two assays. Troponin I proves to be a cost effective assay while improving patient care with a faster, easier to use, test method.

THE EFFECTS OF MESSAGE FRAMING ON EVALUATIONS OF TARGETED OUT-GROUP MEMBERS. *Dee Lisa Cothran* and Elliott Hammer, Tennessee State University, Nashville, Tennessee.*

REVIEW OF TWELVE CASES OF ACUTE PANCREATITIS. *Valerie Sullivan* and James Thompson, Austin Peay State University, Clarksville, Tennessee.* Acute pancreatitis often begins with severe pain in the upper abdomen, which can migrate around to the back and other areas. Unfortunately these symptoms are not unique to acute pancreatitis and a correct diagnosis can only be made after careful observation and testing. For this study, with the help from the director of medical records at an area hospital, twelve patient cases were selected whose primary diagnosis was acute pancreatitis. The patient's history, imaging studies, and lab results were used for a correct diagnosis of this condition. For each patient case, a summary of important factors while in the hospital were recorded and analyzed. Conclusions about common aspects of the diagnosis and treatment of acute pancreatitis are reported.

GROUND LEVEL OZONE IN THE GREAT SMOKY MOUNTAINS NATIONAL PARK: ITS TRANSPORT AND IMPACTS. *Cynthia A. Nicks* and Robert A. Sirk, Austin Peay State University, Clarksville, Tennessee.* Proximity to major urban centers has made the seventy year old, half-million acre, Great Smoky Mountains National Park (GSMNP) one of the most heavily visited recreational areas in the eastern United States. Recognition of the GSMNP's historical, cultural and environmental importance led Congress to designate the park a Class I environmental setting (1977). This designation is meant to insure greater attention to, and protection against, the effects of air borne pollutants. A recent history of air pollution "events" has shown this protection to be "hollow", and puts greater importance on recently revised Clear Air Act standards. The presentation looks briefly at the mechanisms of transport and intensification of ground level ozone, a critical air borne pollutant having significant impacts on the GSMNP and its recreating population. Highlighted will be mechanisms of its atmospheric transport, its human and ecological impacts, and continuing difficulties in bringing about its reduction.

PROTEIN ANALYSIS OF DROUGHT TOLERANCE IN SOYBEAN. *Shana Benton*, D. Long, C. Caudle, and E. Lewis Myles, Tennessee State University, Nashville, Tennessee.* Stress in any organism can be described as any change in environmental conditions that might reduce or adversely change an organism's growth or development. Drought is one of many environmental stresses that crop plants may encounter. Prolonged periods without water can severely reduce crop vigor, and ultimately reduce crop yield. This reduction in yield is often transferred to the consumer as higher prices. Our lab is screening soybeans for drought tolerance. The cultivars used in the study are Forrest and

Hutcheson. The plants grew in 0.0, 0.4 and 0.8% NaCl for seven days. At the end of the seven-day exposure period, the total length, root length, and root weight are recorded. The analyses of the results with analysis of variance (ANOVA) helped in determining the cultivars tolerant to salt. In comparing cultivars Forrest and Hutcheson, we found that Hutcheson is more tolerant than Forrest. One dimensional gel electrophoresis and Western Blots are used to determine the identification of specific protein synthesized in either the sensitive or tolerant cultivars.

A SURVEY OF BACTERIA IN THE PARACLOACAL GLANDS OF PLETHODONTID SALAMANDERS. *R. Jeremy Nichols* and Don Dailey, Austin Peay State University, Clarksville, Tennessee.* Symbiosis is any commensal, mutual, or parasitic coexistence of two or more organisms where one is often dependent on the other. Symbiotic relationships of bacteria and multicellular organisms are prevalent in most ecosystems. We investigated the presence of culturable bacteria in the paracloacal glands of plethodontid salamanders. Salamanders were collected and quickly euthanized with MS222 (ethyl m-aminobenzoated methane sulfonic acid). The region containing the paracloacal glands was dissected from the animal and macerated. Aliquots were plated on EMB, MacConkey, Phenyl Ethyl Alcohol, and nutrient agars. All unique bacterial colonies were subcultured and identified. Bacteria belonging to the following genera were identified from at least 2 different salamanders: *Salmonella*, *Klebsiella*, *Edwardsiella*, *Escherichia*, *Aeromonas*, *Pseudomonas*, *Acinetobacter*, *Staphylococcus*, *Bacillus*, and *Micrococcus*. The significance of each of these genera is discussed.

BARBAN AND CHLORPROPHAM: TWO CARBAMATE HERBICIDES THAT ACT AS MITOTIC DISRUPTORS IN MRC-5 CELLS AND HELA CELLS. *Jacqueline E. Tate* and John R. Palisano, The University of the South, Seawanee, Tennessee.* Carbamate herbicides, such as barban and chlorpropham, disrupt mitosis by destabilizing plant microtubules. Because tubulin has been highly conserved through evolution, plant and animal cells possess similar microtubule structural proteins, microtubule-binding proteins, and organizational proteins. Previous studies using mammalian tumor cells have demonstrated that herbicides also disrupt mitosis in animal cells. This investigation was designed to examine the effect of barban and chlorpropham on MRC-5 cells, a normal human fibroblast cell line, as well as on HeLa cells, a human cervical cancer cell line. Immunofluorescence microscopy studies have revealed that the effect of these two different herbicides could be seen in HeLa cells after 4 h incubation in concentrations of barban from 10–100 μ M and concentrations of chlorpropham from 100–500 μ M. The most common abnormality observed in HeLa cells exposed to these herbicides is the formation of multiple spindle poles in a single cell. In these cells, the condensed chromosomes fail to align properly prior to metaphase. MRC-5 cells exhibited abnormalities after 12 h of incubation in concentrations of barban from 1–10 μ M and concentrations of chlorpropham from 10–100 μ M. Several common abnormalities observed in MRC-5 cells exposed to these herbicides include chromosomes improperly aligned on the spindle apparatus prior to metaphase, the formation of spindle apparatuses in elongated cells, spindle apparatus disorganization, and the disruption of cytoplasmic microtubules. This investigation indicates that MRC-5 cells are sensitive to the herbicides at lower concentrations than the HeLa cells, suggesting that humans

may be more susceptible to damage by herbicides than previously thought.

CADMIUM TOXICITY ON ARTERIOLE VASCULAR SMOOTH MUSCLE CELLS IN NORMALTENSIVE AND HYPERTENSIVE RATS. *Shuntae Williams** and *Benny Washington*, Tennessee State University, Nashville, Tennessee.

SCREENING OF AEROBIC SOIL BACILLI FOR CRY GENES BY PCR. *Jerica Q. McCarter**, *Terrance L. Johnson*, and *Anthony Ejiogor*, Tennessee State University, Nashville, Tennessee.

NUCLEAR MAGNETIC RESONANCE ^1H AND ^{13}C ASSIGNMENTS FOR ASPIRIN USING MOLECULAR MODELING AND 2D NMR. *Kristen Miller**, *Derek Bailey**, and *Harvey Blanck*, Austin Peay State University, Clarksville, Tennessee. Aspirin was studied as part of an undergraduate introduction to NMR, ^1H , ^{13}C , and 2D (HETCOR) NMR. In the 2D spectrum the chemical shift order of the C4 and C6 peaks (ring positions as numbered with the carboxylic acid in position one and the acetate in position two) was found to be opposite that of the attached hydrogens (H4 and H6). Although these relative shifts can be accounted for through the ring activation and deactivation effects of the carboxylic acid group and the acetate group, our research attempted to explain these shifts and to make all spectral assignments using only peak splitting and molecular modeling. Charges on the atoms were calculated using MOPAC 5.0 and PC Spartan plus programs. MOPAC options included AM1, PM3, and MNDO while PC Spartan included AM1 and Gaussian 321 and 631 ab initio calculations. Benzoic acid modeling experiments were used to determine the dihedral angle between the ring and the carboxylic acid group. AM1 and PM3 generated a planar structure for benzoic acid, which is consistent with other work involving trinitrobenzene. Therefore, AM1 was the calculation of choice for the semi-empirical experiments. The atomic charge data for the ring carbons generated by all MOPAC and PC Spartan programs indicated the proper relative shifts for C3 when compared to C6 and C5 when compared to C4. This was then used in conjunction with the 2D spectrum to properly assign the H3 and H6 doublets and the H5 and H4 triplets. The modeling also allowed assignments of C1 and C2 on the ^{13}C spectrum. The charge data did not predict the correct order for C4 and C6, but assignments can be made from the 2D spectrum. The carbon relative chemical shift order is from left to right 2, 4, 6, 5, 3, and 1; while that of the attached hydrogens is 6, 4, 5, and 3. The charge data generated for the hydrogens was less predictive than data for the carbons.

LEARNING TO PREPARE STANDARD SOLUTIONS IN QUANTITATIVE ANALYSIS LABORATORY USING INSTRUMENT FEEDBACK. *Virginia L. Mattie**, *Nyanguila Kakolesha*, and *Judith M. Bonicamp*, Middle Tennessee State University, Murfreesboro, Tennessee. Quantitative Analysis students make standard solutions for most of the experiments in Quantitative Analysis lab. They receive instructions both in lecture and in lab briefing on the use of volumetric glassware, on solution preparation, and on making serial dilutions. However, students who correctly answer exam questions about preparing standard solutions often ignore what they know when it comes to practice. We are testing an exercise to help students acquire good laboratory skills and to reinforce these skills early in the course. The students use a feedback loop from simple laboratory instruments

(Spectronic 20D, conductivity meter, freezing point apparatus) to get fast, quantitative data about the solutions they've made. Student reactions to the exercise have been uniformly positive. They view the instrument feedback as objective and interesting.

ASCORBIC ACID ENHANCED LOTIONS. *Chris J. Rogers** and *Patricia J. M. Dycus*, Tennessee Technological University, Cookeville, Tennessee. Ascorbic acid (Vitamin C) has long been known to have several medical benefits including the prevention of scurvy and as a protective antioxidant for the body's various tissues. More recently, however, its roles in wound healing and tissue growth promotion through aiding in the synthesis of collagen have been studied and documented. For this reason, the development of a medium to deliver the ascorbic acid directly to the skin would be quite beneficial. Furthermore, the medium should be one that can be applied to the skin comfortably. The obvious vector for this transmission with the above specification is a lotion. With lotion as the medium, a person can apply this nutrient and oxidation shield as often as multiple times per day without making them feel uncomfortable, as is the case with most gel based agents. However, because of ascorbic acid's tendency to be oxidized, forcing it into such an emulsion while keeping the ascorbic acid (as well as the emulsion) stable is an extremely difficult task. Lotions with varying compositions and ascorbic acid concentrations were prepared and studied for stability. The stability of mixtures of the individual components and aqueous ascorbic acid also were studied. Presently, a completely stable emulsion has not been found, but research continues. Several discoveries from experimentation performed thus far point to the possible mechanisms of degradation, and may therefore allow us to attenuate them; thereby formulating a stable ascorbic acid enhanced lotion.

POPULATION ANALYSIS OF RADIOACTIVE DECAY BY COMPARTMENTAL MODELLING: DETERMINATION OF THE MAGNITUDE OF RESIDUAL RADIOACTIVITY OVER TIME OF 22 PRINCIPAL RADIONUCLIDES RELEASED FOLLOWING THE 26 APRIL-1986 ACCIDENT AT THE CHERNOBYL NUCLEAR POWER PLANT UNIT NUMBER 4. *Brett Palmer** and *David Holder*, Tennessee State University, Nashville, Tennessee. Calculations of daughter isotope populations of the four heavy radionuclide decay series to stable nuclides and of the major radioisotopic species released after the Chernobyl Nuclear Power Plant Unit No. 4 accident were performed using compartmental modeling analysis with the Statistical Analysis And Modeling II (SAAM II) computer software.

EFFECTS OF HUMIDITY AND SORBENT WEIGHT ON EXTRACTION OF OPIATES FROM HUMAN URINE BY SOLID PHASE EXTRACTION MICROCOLUMNS. *Jennifer Pendergrast**, *Erika Carillon*, and *Judith M. Bonicamp*, Middle Tennessee State University, Murfreesboro, Tennessee. We can differentiate heroin, codeine, morphine and their metabolites from each other using a simplified and accelerated thin-layer chromatographic technique employing special sample application discs and a sequence of detection reactions. The detection limit for opiates is 1 mg/ml from urine by liquid-liquid extraction. Further improvement in the detection limit results when solid phase extraction columns (SPECb7 LTDT 7MP3 microcolumns) are employed, giving a detection limit of about 200 ng/ml for unconjugated morphine and other opiates under ideal conditions. After we addressed some problems, urine specimens extracted with the SPEC columns were routinely positive for morphine for

several days after subjects ate poppy seed food. We have compared the extraction efficiency of columns with sorbent weights of 15 and 30 mg silica. We also have shown that, as with other silica based chromatographic material, this product performs better when it is stored with a drying agent. The effect of moisture gained by the SPEC columns is a concomitant reduction in separation power on the silica sorbent microcolumns. The result reinforces the importance of running calibrators to assure that the extraction columns perform as expected.

BOVINE SERUM ALBUMIN CATALYSIS IN ORGANIC SYNTHESIS. *Patrizia Lemma-Gray* and Sean Liu, Austin Peay State University, Clarksville, Tennessee.* Bovine Serum Albumin (BSA) was used as a potential catalyst in the synthesis of methyl-alpha-D-glucopyranoside-6-acrylate, from methyl-alpha-D-glucopyranoside and acrylic acid vinyl ester, in dry pyridine solvent. The results showed that the protein was not a functional catalyst in the reaction. However, preliminary results showed that BSA might greatly increase the rate of reaction when used to catalyze the isomerization of benzisoxazole in acetonitrile.

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THE EFFECTS OF *PUERARIA LOBATA* ON THE DIVERSITY OF PLANT SPECIES. *Elizabeth Graham and Scott Franklin, Christian Brothers University, Memphis, Tennessee, and The University of Memphis, Memphis, Tennessee.* The kudzu vine, *Pueraria lobata*, has the ability to destroy valuable forests by reaching up to heights of 40 feet or more depending on the substrate the kudzu is growing on, thereby preventing underlying trees and plants to receive sunlight. This physical blockade prevents photosynthesis from occurring and causes trees to die. The purpose of this study was to investigate the effects of kudzu on the diversity of plant species under the kudzu vine. The reestablishment of plants after the eradication of the kudzu by using a herbicide also was investigated. Two areas adjacent to ponds at the Meeman Biological Station in Shelby Forest, Tennessee were used in this study. Payne's Pond, which had no kudzu surrounding it served as the control, and was compared to Kudzu Pond, which was completely surrounded by kudzu. A third area, Kudzu slope, was a control which was covered in kudzu but no herbicide was applied to this area. Forty plots of soil adjacent to each pond were studied for diversity of plant species and percent coverage of the foliage of each plant. The herbicide, Transline, was then applied to the area around Kudzu Pond and the kudzu was eradicated, while no herbicide was sprayed at Payne's Pond. The plots at Kudzu Pond were then monitored for regrowth of plants. The results showed that the initial diversity of plant species was much greater at Payne's Pond as expected, showing that kudzu is harmful to other plant species living in the area. There were no plants found growing under the kudzu before its eradication. Plants were observed growing after herbicide treatment and seeds must have originated from dispersal by wind, water, or animals to that area. In conclusion, the kudzu vine has devastating effects on plant life where the vine grows, and if it is eradicated to save valuable forests it is destroying, new seedlings will most likely have to be introduced for reforestation to occur.

EFFECTS OF HERBICIDAL TRANSLINE TREATMENT OF *PUERARIA LOBATA*. *Heather Carpenter and Jack Grugbaugh, Christian Brothers University, Memphis, Tennessee, and The University of Memphis, Memphis, Tennessee.* *Pueraria lobata*, commonly known as the kudzu vine, was introduced to the southern United States in 1876. Due to its progressive expansion, many persons have tried to control the spread and possibly eliminate kudzu. Benthic invertebrates can be used as a bioindicator, where high diversity is indicative of a healthy environment. In this study, the distribution of benthos from two ponds was investigated before and after one pond area was treated with a legume specific herbicide, Transline. This was done in order to observe the pollutant effects, if any, of the treatment on the environment. The first pond was surrounded by the kudzu vine (Kudzu pond), and the other pond was not (Payne's). The area adjacent to Kudzu pond was treated with Transline. Pre and post-treatment samples from both ponds were collected, washed, stained, and preserved before taken to the laboratory where the benthos were visualized, extracted and identified. Data were collected for analysis and manipulated using percent dominance, number of taxa per sample collection, and Simpson's index of diversity. Results show no decrease in diversity, evenness or richness between the benthic invertebrate samples taken pre and post-treatment. In conclusion, these results can be generalized to no apparent immediate effects, pollutant or other, on the immediate environment by the herbicidal treatment of kudzu with Transline. Long-term effects are unknown at this time.

TICK CEMENT CONES. *David Conner, Lou Boykins, and Lewis Coons, Christian Brothers University, Memphis, Tennessee (DC), and The University of Memphis, Memphis, Tennessee (LB, LC).* Ticks are of medical as well as economical importance because they are the number one vector for vector-borne transmittable diseases. The purpose of this study was to investigate the relationship between the tick and its attachment to the host. Part of this attachment is a cement cone that secures the tick. Partially fed female *Dermacentor variabilis* (5-7 days) were processed and viewed with the scanning electron microscope. Samples of individual cement cones also were dissected from these ticks. Micrographs reveal that the tick mouthparts are anchored in the cement cone, forming a sealed food canal for blood uptake and shielding the tick from the host. Micrographs also reveal that the cement cone has an amorphous surface. The cement cone has several functions and plays a vital role in the relationship between the tick and the host.

UTILIZATION OF MINERAL LICKS BY MAMMALS WITH SPECIAL EMPHASIS ON WHITE-TAILED DEER. *Lantana Wood, J. A. Huggins, and H. W. Wofford, Union University, Jackson, Tennessee.* Use of mineral licks by deer is a well-documented phenomenon, but the patterns of use change from season to season. Hunting pressure and rut season are known to affect activity levels, so the fall and winter patterns of use by deer was the focus of this study. A motion-sensitive camera was used to document visits, including time of day and duration of stay. Not only were visits by deer documented, but also by squirrels, rabbits and raccoons. In this study, the greatest frequency of deer visits in the fall occurred between 1:00 and 3:00 AM, while in other studies this usually occurred between 6:00 and 8:00 AM. Therefore, the results of this study do not concur with previously documented information on peak activity use of mineral licks by deer.

GROUND WATER RESPONSE TO FLOODING OF STOKES CREEK PRIOR TO DECHANNELIZATION. **Tanya L. Scheff, J. A. Kupfer, and S. B. Franklin**, *The University of Memphis, Memphis, Tennessee*. Knowledge of the hydrology of a wetland is vital in the understanding of groundwater and its response to flooding. It also is essential in that better flood management practices can be put into operation. Channelization has long been one of the prime methods of flood control in river management, yet it becomes more apparent this practice is sometimes no longer effective or economical. Land managers are investigating dechannelization as an alternative method. In this paper regression analysis was used to correlate groundwater and river stage data. However water table fluctuations in comparing depressional and nondepressional sites differ between the two rivers.

VEGETATION DIFFERENCES BETWEEN A NATURAL AND CHANNELIZED BOTTOMLAND. **R. A. Hansen, S. B. Franklin and J. A. Kupfer**, *The University of Memphis, Memphis, Tennessee*. In an effort to understand the effects of channelization on floodplain forest systems, vegetation data were collected from two streams and compared. Stokes Creek was chosen as the research site for a channelized stream, and the Wolf River (just upstream of Moscow) was chosen to represent a more natural bottomland system (site factor). Two to four rectangular vegetation plots were established on each of nine transects scattered along the stream course. The plots were stratified based on whether or not they were depressions (location). Multi-response permutation analyses indicate that the vegetation site-location interaction was significantly different in the overstory, but not in the herbaceous community. The data indicate that the impact on hydrology by channelization has affected bottomland vegetation.

A STUDY OF THE SEASONAL VARIATION IN OVERALL ABUNDANCE OF MACROINVERTEBRATES. **Andrew G. Briese and Jack Grubaugh**, *Christian Brothers University, Memphis, Tennessee, and The University of Memphis, Memphis, Tennessee*. Patterns of distribution and abundance of aquatic insects indicate successful adaptations to a wide variety of habitats. The purpose of this research was to examine the seasonal (spring-summer-fall) variation in the overall abundance of macroinvertebrates in the littoral and profundal regions of two different ponds. Three samples were taken each month per zone in both ponds, washed free of sediment, and preserved in formalin with phloxine to aid in processing. Invertebrates were counted and classified. Simpson's index was used to determine macroinvertebrate diversity. Analysis of variance was used to compare overall abundance, richness, and diversity changes between seasons. No significant differences were found in any of these parameters from spring to fall. Several changes in taxonomic composition did occur; for example, Hydrobiidae was found only in October in Payne's littoral zone. Simpson's index also indicated a pattern of increasing diversity as seasons progressed. Results indicate a possible dynamic equilibrium for abundance and richness, with some taxa replacing others as seasons change. Trends of increasing diversity may reflect recruitment of individuals into benthic populations following the summer breeding season.

EFFECT OF IFN- γ ANTIBODY ON THE LATENCY PERIOD OF CRYPTOSPORIDIOSIS INFECTION IN SCID MICE. **Michael Gipson, Jerold E. Rehg, Tony Capizzani, and Mark McGaw**, *Christian Brothers University, Memphis, Tennessee (MG), and St. Judes Research Hospital, Memphis, Tennessee*

(*JER, TC, MM*). Cryptosporidiosis is an opportunistic disease that causes severe dehydration and ultimately death in many immunocompromised patients. The effect of IFN- γ antibody on the latency period of cryptosporidial infections in SCID mice was evaluated. Different titered amounts of IFN- γ antibody secreting hybridoma cells were injected subcutaneously into SCID mice to determine the optimal level of cells that would evoke a reduction in the latency period. Mice were randomly selected from either 14 or 28 days post-oocyst inoculation for assessment of infection. The ileum from each mouse was examined for the presence of infection. At both time periods no significant sign of infection was seen in any of the hybridoma cell-injected mice. Since the dexamethasone control groups did show infection as expected, it is proposed that the hybridoma cells lost their ability to secrete the IFN- γ antibody due to continuous cell culturing. By blocking IFN- γ , the infected mouse would show a peak level of infection, possibly as early as two weeks post-inoculation, thus decreasing the latency period of infection. This allows the researcher to run more experiments and test for the effectiveness of more chemotherapeutic agents than would be possible with current constraints.

CYTOSOLIC PHOSPHOLIPASE A₂ IS PHOSPHORYLATED AND ACTIVATED BY CALCIUM/CALMODULIN DEPENDENT PROTEINKINASE. **Matthew A. Dress, Mubarak M. Muthalif, Jason L. Harper and Kafait U. Malik**, *Christian Brothers University, Memphis, Tennessee (MAD), and The University of Tennessee, Memphis, Memphis, Tennessee (MMM, JLH, KUM)*. It has been reported that norepinephrine stimulates calcium/calmodulin dependent protein kinase II (CaMK II), which activates cytosolic phospholipase A₂ (cPLA2) and mitogen activated protein kinase (MAPK) and releases arachidonic acid. Arachidonic acid metabolites have been implicated in numerous physiological processes. The products of arachidonic acid generated via cytochrome P-450 and lipoxygenase activate MAPK, which amplifies cPLA2 activity by a positive feedback mechanism. The purpose of this study was to determine if CaMK II directly phosphorylates and activates cPLA2. CaMK II obtained from rat brain caused phosphorylation of purified recombinant cPLA2 (3 μ g) within 2 min. Phosphorylation continued in a time-dependent manner, with a maximal phosphorylation occurring at 60 min. CaMK II failed to phosphorylate cPLA2 in the absence of calcium ions (Ca²⁺) and calmodulin. cPLA2 immunoprecipitated from rabbit vascular smooth muscle cells also was phosphorylated in vitro by purified CaMK II. Addition of MAPK further enhanced phosphorylation of recombinant cPLA2. Phosphoamino acid analysis showed that cPLA2 is phosphorylated by CaMK II on serine residues. These data suggest that CaMK II directly phosphorylates and activates cPLA2, which is further activated upon phosphorylation by MAPK.

INDUCTION OF CANCER CELL APOPTOSIS BY DOXORUBICIN AND N-BENZYLADRIAMYCIN-14-VALERATE. **Brinson Boyte and Len Lothstein**, *The University of Tennessee, Memphis, Memphis Tennessee, and Christian Brothers University, Memphis, Tennessee*. The regulation of cancer cell apoptosis by various anthracycline derivatives is an ongoing area of research. The purpose of this experiment was to determine if there are different mechanisms of cytotoxicity in anthracyclines based on structural modifications. The two drugs used in this experiment were Doxorubicin (DOX) and N-benzyladriamycin-14-valerate (AD 198). Human leukemic cells of the CEM cell line were ex-

posed to both drugs at various concentrations and time frames. The cells were then counted and examined for evidence of apoptosis using either Trypan Blue stain and a hemocytometer, or bis-benzimide stain and fluorescence microscopy. Each cell count was used to determine an apoptotic index for that sample. The apoptotic index, or number of apoptotic cells per three hundred counted, was then used to compare the cytotoxicity of the two drugs. In repeated trials AD 198 showed a greater apoptotic index and therefore greater cytotoxicity no matter which concentration and time frame was used. These results support the previous belief that DOX and AD 198, although structurally similar, have different methods of apoptotic induction and mechanisms of cytotoxicity. This conclusion opens the door for further research and improvement of anticancer drugs based on structural modifications.

EFFECT OF PAPAINE ON CELLULOSE ACTIVITY IN *ACHLYA AMBISEXUALIS*. *Vanessa Hardin and Terry Hill, Rhodes College, Memphis, Tennessee.* Cellulases are enzymes involved in cell wall degradation of many organisms. The fungus-like protist *Achlya ambisexualis* demonstrates increased cellulase release during osmotic stress. The mechanism by which *Achlya* is able to differentially express cellulases when needed is not fully understood, yet it is known that cellulases are associated with cellular membranes and are secreted at times. The objective of this study is to examine the effects of a protease, papain, on activation of cellulases associated with the cell membrane. Several treatment groups were exposed to varying levels of papain, and these samples were separated via gel electrophoresis. Intrinsic to the gel is a cellulose substrate, which allows detection of the cellulases at various molecular weights. This treatment released multiple cellulases, including some of the same molecular weight as those present in osmotically-stressed samples. Proteolysis may serve as a mechanism for cellulase activation and release in vivo for *Achlya ambisexualis*.

EFFECTS OF CAFFEINE ON BLOOD PRESSURE AND URINE OUTPUT IN *RATTUS NORVEGICUS*. *A. S. Whigham and J. A. Blundon, Rhodes College, Memphis, Tennessee.* In order to examine the effects of caffeine on blood pressure and urine output, the urinary bladders and carotid arteries of anesthetized rats were cannulated. Urine output was quantified with a drop counter and direct blood pressure was determined with a pressure transducer. Specifically, pressure recordings were analyzed for mean arterial pressure (MAP), heart rate (HR) and stroke volume (SV) (systolic-diastolic pressure). After initial control recordings, a 0.5 ml dose of 5 mM caffeine was administered to the rats. The results showed an initial decrease in MAP after injection, followed by a greater increase. At minimum MAP, both HR and SV showed an increase relative to Pre-injection levels. At maximum MAP, both HR and SV showed a decrease. Urine output greatly increased after caffeine administration. Present experiments are being performed to examine the specific mechanisms of the observed effects.

DETECTION OF EXTENDED-SPECTRUM β -LACTAMASE (ESBL) PRODUCING STRAINS BY THE ETEST ESBL SCREEN IN *ENTEROBACTERIACEAE* AND *KLEBSIELLA* SPECIES AND THEIR IMPORTANCE IN DETERMINING PROPER CHEMOTHERAPEUTIC TREATMENTS. *Jonathan Gray, T. Malone, and H. W. Wofford. Jackson-Madison County General Hospital (JG, TM), and Union University, Jackson, Tennessee (HWW).* β -lactamases are enzymes present in microbes

that are capable of altering the β -lactam ring of penicillins and cephalosporin antibiotics by hydrolyzing it. However, extended spectrum β -lactamase-producing microbes are resistant to ESBL drugs, primarily extended spectrum cephalosporins, such as ceftazidime. The Etest is an antibiotic strip with two antibiotics on each end with MIC values labeled to distinguish the level of resistance present. Ceftazidime and ceftazidime plus clavulanic acid are the two antibiotics used to detect ESBLs in this study. Twenty-eight clinical isolates were studied with 19 showing resistance, suggesting the presence of ESBLs.

CHARACTERIZATION OF SERUM PROTEIN PROFILES OF LARGE MOUTH BASS (*MICROPTERUS SALMOIDES*) AND CHANNEL CATFISH (*ICTALURUS PUNCTATUS*). *Doug Forbes, Melissa Miller, and Tom Eurell, Union University, Jackson, Tennessee (DF), and The University of Illinois, Urbana, Illinois (MM, TE).* Channel catfish (*Ictalurus punctatus*) and large mouth bass (*Micropterus salmoides*) are important as recreational and aquacultural species, and as potential biomonitors of environmental damage. However, little information is known about the blood serum proteins of these fish. The purpose of this research was to establish normal reference serum protein profiles for each of these species. It is important to have normal reference values for blood proteins because of their physiologic and immunologic roles in the body. Blood was collected and processed for serum from 100 fish, judged to be in good health, from several southern Illinois lakes. Electrophoretic and image analysis of serum proteins was performed to establish the normal reference distribution in these two species. Results indicate that indeed different species have different serum protein profiles.

EFFECT OF DIETARILY ADMINISTERED ENDOCRINE-DISRUPTING AGENTS ON HEPATIC CYTOCHROME P-450 AND ESTROGEN RECEPTOR ALPHA EXPRESSION IN MALE AND FEMALE RATS. *Vanessa Hardin and Elizabeth Laurenzana, Rhodes College, Memphis Tennessee, and National Center for Toxicological Research, Jefferson, Arkansas.* Certain environmental chemicals mimic or inhibit the action of the gonadal steroid hormones, causing a disruption in the endocrine system; hence the name, endocrine disrupters. By acting through the microsomal Cytochrome P-450-dependent monooxygenase system of the liver, endocrine-disrupting agents can alter the expression of hormonally regulated Cytochrome P-450 (CYP450) enzymes, as well as hormone receptors like Estrogen Receptor Alpha ($ER\alpha$). The objective of this study was to examine the effect of endocrine-disrupting chemicals (Vinclozolin and Methoxychlor) on hepatic CYP450 and $ER\alpha$ expression among male and female rat treatment groups. Both chemicals altered the pattern of expression of CYP450 isoform and $ER\alpha$ expression; furthermore, these results suggest that endocrine-active agents have differential effects on hepatic CYP450 and $ER\alpha$ in male and female rats. This complex pattern of hepatic enzyme induction and inhibition may have consequences for the clearance and toxicity of various compounds metabolized via the liver by altering metabolism and level of receptor available.

THE IMPORTANCE OF POLYAMINES IN RETINAL PIGMENTED EPITHELIAL CELLS. *Jonathan R. Keith and Dianna Johnson, Christian Brothers University, Memphis, Tennessee, and The University of Tennessee, Memphis, Tennessee.* The Retinal Pigmented Epithelial Cell (RPE) layer serves and protects the integrity of the neural retina to carry out proper function. Many

diseases are considered to be solely a result of retinal dysfunction, but may actually be the result of RPE dysfunction. One possibility for dysfunction are compounds known as polyamines, which aid in regulation of cellular processes such as speed and accuracy of gene transcription and protein phosphorylation. Therefore, we examined the importance of polyamines in RPE development. RPE cells were isolated from fetal rabbits. Once cultures had been established, the cells were grown in serum free culture over a three day period in DFMO to block polyamine synthesis. The cells were fixed in 4% Paraformaldehyde overnight, stained using the fluorescent tag Rhodamine conjugated phalloidin, which binds f-actin filaments, and examined under a fluorescent microscope to observe cell morphology. When compared to RPE grown in normal cell culture, the DFMO treated cells appeared deformed. These results suggest that polyamines may be essential to maintain normal function in RPE cells and that polyamine depletion could be a trigger for retinal dysfunction.

THE CONTRIBUTION OF P70S6K IN FL-HEXOSAMINIDASE A STIMULATED PROLIFERATION OF BOVINE AIRWAY SMOOTH MUSCLE CELLS. *J. R. Jackson, Y. Zhao, and D. B. Lew, Christian Brothers University, Memphis, Tennessee (JRJ), and The University of Tennessee, Memphis, Memphis, Tennessee (YZ, DBL).* Ribosomal p70s6k (p70s6k) is a mitogen activated serine/threonine kinase that is required for cell growth and G₁ cell cycle progression. We investigated the role of p70s6k in fl-hexosaminidase A (Hex A) stimulated bovine airway smooth muscle cell (ASMC) proliferation. Cellular proliferation of airway muscle is a key factor in airway remodeling, a well recognized pathological change in asthma. Rapamycin (1.0 nM, 30 min pretreatment), a known inhibitor of p70s6k, inhibited DNA synthesis (100%) and Hex A (50 nM induced cellular proliferation (53%) as measured by ³H-thymidine incorporation and tetrazolium salt reduction (MTT) assays. Rapamycin also inhibited p70s6k activation in Hex A stimulated ASMC as measured by immune complex in vitro kinase assay. These data suggest that p70s6k is important to cellular proliferation in Hex A stimulated ASMC, which may assist us in developing a drug that affects airway remodeling in asthma.

REDUCTION OF NITRATE TO NITRITE: DOES VARYING NADPH CONCENTRATIONS IMPROVE NITRITE RECOVERY? *G. Grokulsky, Y. B. Wang, and E. S. Kang, Christian Brothers University, Memphis Tennessee (GG), and The University of Tennessee, Memphis, Memphis, Tennessee (YBW, ESK).* Nitric oxide (NO) is essential for the regulation of many physiological and pathological processes. Quantification of NO itself is difficult because NO is readily oxidized by molecular oxygen to nitrite (NO₂) and nitrate (NO₃). The Greiss reaction can be used to quantify NO levels as NO₂, but not as NO₃. Prior to assay, Reduction of NO₃ to NO₂ using nitrate reductase in the presence of nicotinamide adenine dinucleotide phosphate (NADPH) is possible before the Greiss reaction. A second enzyme/substrate system, glutathione reductase and oxidized gultathione, can oxidize excess NADPH to NADP. NADP would not interfere with the Greiss assay. Determining the optimal NADPH concentration for recovery of NO₂+NO₃ by this 2-step reaction was the objective. Mixed standards of NO₂ and NO₃ from 10–100 μM were analyzed by the 2-step method with 0.25, 0.5, 0.75, and 1 mM NADPH. Recovery as NO₂ of NO₂+NO₃ greater than 20 μM diminished as NADPH was decreased. Recovery of NO₂+NO₃ less than 20 μM was not diminished across the NADPH concentrations studied. Re-

covery of NO₂ at all concentrations of NO₂+NO₃ was close to 100% at 1 mM NADPH. These findings indicate that optimal recovery of total NO₂ by the Greiss reaction after reduction of NO₃ to NO₂ is achieved using 1.0 mM NADPH.

CLASSIFICATION OF NONPYRAMIDAL NEURONS BASED ON THE CORRELATION OF MORPHOLOGY AND PHYSIOLOGY. *Angel Barritt, Shaul Hestrin, and Mario Galarreta, Christian Brothers University, Memphis, Tennessee (AB), and The University of Tennessee, Memphis, Memphis, Tennessee (SH, MG).* An accurate classification of neurons of the cerebral cortex is yet to be accomplished. The purpose of this research was to determine if a correlation could be found between the morphology and the physiology of nonpyramidal neurons to more accurately classify these cell types. Physiological studies were conducted on cortical brain sections of 14–21 day old rats. Recorded neurons were identified using the intracellular label biocytin. Immunologically identified biocytin positive pyramidal and nonpyramidal neurons were classified on the basis of morphological and physiological characteristics. Nonpyramidal cells were classified as bitufted, bipolar, or multipolar. Physiologically the nonpyramidal cells were classified as fast-spiking or regular-spiking. Bitufted and bipolar cells characteristically exhibited regular-spiking action potentials, with multipolar cells showing fast-spiking action potentials. Although it cannot be concluded that there is a direct causal relationship between the morphology and the physiology of these neurons, distinct characteristics of nonpyramidal cells observed in this study could be used to further explore the function of cortical neurocircuitry.

EFFECTIVENESS OF PRIMER R105 AS A GENETIC MARKER FOR CANINE HIP DYSPLASIA. *Marlo Anderson, Amy Miller, and Keith Murphy, Christian Brothers University, Memphis Tennessee (MA), and The University of Memphis, Memphis, Tennessee (AM, KM).* Canine Hip Dysplasia (CHD) is a polygenic disease that causes abnormal development of the hips. It results partly from an increase in joint laxity. DNA from the Boykin Spaniel breed has been previously analyzed by randomly amplified polymorphic DNA technique using the primer r105. That analysis showed primer r105 gave a high percent of correctness in identifying increased joint laxity. This current study was conducted to expand on previous data by using the same primer r105, but modifying the variables, sample size and selection of subjects. Our results showed that primer r105 was inconsistent in the larger sample of non-pedigree dogs. In our samples, primer r105 produced a large margin of error in identifying dogs with increased joint laxity. We can conclude that primer r105 is a poor genetic marker for CHD, but may prove useful for other genetic traits in a pure pedigree line.

NOTOCHORDAL CELLS OF THE NUCLEUS PULPOSUS. *Jenelle L. Kendall, Kelly L. Harris, Arthur J. Vaught, Eldridge F. Johnson, and James T. Robertson, Lane College, Jackson, Tennessee (JLK), and The University of Tennessee, Memphis, Memphis, Tennessee (KLH, AJV, EFJ, JTR).* The intervertebral disc is the largest avascular structure of the body. It is largely a fibrocartilaginous joint attached to contiguous vertebrae of the osseous spine. It acts as a shock absorber, provides flexibility, and resiliency to the spinal column. The structure of the intervertebral disc consists of three components: annulus fibrosus, nucleus pulposus and hyaline cartilage end plates. A light microscopic investigation of the nucleus pulposus in the human intervertebral disc was un-

dertaken in order to ascertain cell types and their organization in the nucleus pulposus matrix. An age-graded series of human intervertebral discs were embedded in paraffin, sectioned serially, and stained via routine histological processing. Notochordal cells were found in all nucleus pulposi observed, ranging, from 19-62 years of age. The largest number of such cells was observed in the young adult 19 years of age and the least number was seen in the older age group (50-62 years of age).

SURVEY OF THE REPTILE AND AMPHIBIAN COMMUNITIES OF THE NATCHEZ TRACE STATE FOREST. *J. G. Slothouber, J. W. Grubaugh, and S. B. Franklin, The University of Memphis, Memphis, Tennessee.* In order to compare herpetofaunal community composition between forest types, reptiles and amphibians were trapped at 21 sites constituting seven different forest types at the Natchez Trace State Forest (Carroll and Henderson Counties, Tennessee). A total of 320 individuals representing 20 species were captured. Most common species collected included the green frog (*Rana clamitans*) and northern slimy salamander (*Plethodon mississippi*). No clear community associations could be determined for herpetofauna among the forest types. These results suggest that the Natchez Trace forests may still be in a transitional stage, and establishment of distinct vertebrate communities lags behind vegetational community development.

ROLE OF VISION IN THE PREDATORY BEHAVIOR OF GRAY RAT SNAKES, *Emily Moore, The University of Memphis, Memphis, Tennessee.* In order to assess the role that prey coloration plays in predatory response, white and dark laboratory mice were presented in eight separate trials to foraging gray rat snakes (*Elaphe obsoleta spiloides*). Strength of response was measured as time elapsed from initial predatory/prey encounter to an attempted strike. Both male and female snakes were used during the trials. Based on pooled (both sexes) data, no significant differences in response were noted by color. Male snakes, however, exhibited a significantly quicker response to white mice than did females. This difference may suggest the existence of sexual predatory bimodalism in gray rat snakes.

MIGRATION OF THE GIANT CLOUDLESS SULPHUR BUTTERFLY PHOEBIS SENNAE: WHERE AND HOW? *C. Zane Nash, Rhodes College, Memphis, Tennessee.* Huge swarms of Giant Cloudless Sulphur Butterflies *Phoebis sennae* flying southeast last fall caught the eye of lepidopterists throughout the eastern United States. Vanishing-point bearings of *P. sennae* taken during the ethology course I took last fall showed a mean heading of 136 degrees over a one-week period in September at Rhodes College in Memphis, Tennessee. Observations from other students, scientists, and amateurs indicate *P. sennae* were migrating from as far north as New Jersey and as far west as Kansas, heading toward south Georgia and Florida. Data from past studies indicate that this is a regular phenomenon, contrary to currently published accounts. This study also examines the current state of research on butterfly migratory behavior covering theories of navigation and physiological mechanisms.

THE EFFECTS OF CAPTIVITY ON THE SOCIAL AND BEHAVIORAL PATTERNS OF MEERKATS. *Gina Heathcott, Chuck Brady, and James A. Huggins, Union University, Jackson, Tennessee, and The Memphis Zoo, Memphis, Tennessee.* The meerkat (*Suricata suricatta*) is a South African mongoose for

which minimal information is available regarding their behavior in captivity. The social behavior and groupings of nine meerkats in captivity were observed, while paying close attention to the location of the three babies in the group and the dominant mother. The location of each baby in the group was compared to the location of the mother in order to gain a better understanding of the social nature of meerkats and their patterns for raising babies within the group. The study also was done in order to gain a better understanding of the positive and negative aspects of keeping meerkats in captivity, and the effects it may have on their social and behavioral patterns. It was found that the young meerkats had a tendency to spend more time with the other adults in the group, rather than the mother.

THE EFFECTS OF S-METHOPRENE ON THE DEVELOPMENT OF THE LEOPARD FROG (*RANA PIPIENS*) TADPOLE. *Nina Akins and H. W. Wofford, Union University, Jackson, Tennessee.* In the past decade, numerous locations across North America have been found to contain abnormal levels of deformed amphibians. There are several theories that have been proposed for the cause of these deformities. However, a definite cause has not yet been isolated. The most likely theory that scientists have been focusing on is chemicals from agricultural pesticides found in ponds. One of the chemicals under investigation is methoprene, a pesticide. The purpose of this research was to determine the effects of s-methoprene and its breakdown products upon exposure to ultra violet rays on the development of the leopard frog *Rana pipiens*. Tadpoles exposed to s-methoprene under laboratory conditions had a deformity rate of 2.1 %, while those exposed to ultra violet radiation-treated s-methoprene had a deformity rate of 8.7%. No deformities were observed in controls.

PHOTORECEPTOR CELL DEVELOPMENT IN DISSOCIATED RETINAL CULTURES. *T. E. O'Leary, C. M. Withrow, and D. A. Johnson, Christian Brothers University, Memphis, Tennessee (TEO), and The University of Tennessee, Memphis, Memphis, Tennessee (CMW, DAJ).* Purpose: We have examined cell cultures of developing rabbit retina in order to investigate the cellular aggregation. We also have examined the preferential separation of inner and outer retina layers in culture. Methods: Dissociated retinal cultures were grown in control medium. Some cultures were co-cultured with retinal pigment epithelium (RPE) to identify any relation between retinal cells and RPE. The samples were stained with toluidine blue stain, a general cytoplasmic stain that allows for visualization of the retinal cell bodies. Results: The dissociated cell cultures formed aggregates of two types. One containing cells from the inner retina and the other with cells from the outer retina. The outer retinal aggregates, termed rosettes, consisted of a horizontal cell surrounded by photoreceptor cells. When RPE was added to the cultures, the RPE cells preferentially appeared with rosettes. The two types of clusters were attached to different regions of the cover slip. The aggregates formed within one hour in culture. Given longer time intervals, the aggregates became more compact. Conclusions: The rapid separation of the cell aggregates shows preferential cell-to-cell adhesion is taking place. Formation of two separate cell cluster types could result from a specific binding site.

MOLECULAR BASIS FOR THE ANTI-PNEUMOCYSTIS CARINII ACTIVITY OF PENTAMIDINE. *Patrice L. Jackson and Isaac O. Donkor, LeMoyné-Owen College, Memphis, Tennessee, and The University of Tennessee, Memphis, Memphis, Tennessee.*

The focus of this research was to investigate if DNA is the molecular target for the anti-*Pneumocystis carinii* action of pentamidine. Pentamidine analogs of varying pKa values were synthesized. The pKa values of the compounds were determined by titration against 0.02 N NaOH or 0.04 N HCl and the half point of neutralization was determined graphically. pKa is an important determinant of the ability of compounds to bind to the minor groove of DNA, which exhibits a high negative potential. Thus, compounds with high pKa should have high affinity for DNA. It was anticipated that a correlation between pKa, DNA binding affinity, and in vitro anti-*P. carinii* activity would be observed if DNA is the molecular target for the anti-*P. carinii* action of Pentamidine and its analogs. Since this is an ongoing project, no definitive conclusion can be drawn at this point.

ANTHROPOLOGICAL ANALYSIS OF SHARP TRAUMA IN CARTILAGE AND BONE. *G. A. Horton and S. A. Symes, Christian Brothers University, Memphis, Tennessee.* In autopsy, Medical Examiners are often faced with the presence of sharp trauma. The most common problem involves a lack of meticulous examination. Autopsy findings of "very sharp" or "single edge blade" offer little to a homicide investigation. Preservation of sharp trauma also is a problem. When trauma is limited to bone, the specimen is simply removed in autopsy and processed free of soft tissue for analysis. Cartilage is subject to dehydration and therefore difficult to preserve. Thus the only solution is to make a permanent cast of the wound by using a forensic casting material. The final product becomes a permanent representation of the tissue. Knives produce characteristics that help forensic scientists narrow the field of suspect weapons. This research and case studies help to illustrate the potential "class" of knives used in a crime. Other types of characteristics such as voids, major and minor knife tool marks, and striations give specific clues, which aid in pinpointing traits that can and do add to evidence presented in a court of law.

CONTRIBUTION OF ARACHIDONIC ACID METABOLITES OF CYTOCHROME P-450 AND RAS GTPASE TO DEOXYCORTICOSTERONE-SALT INDUCED HYPERTENSION IN RATS. *Suzana Malik, Mubarik Muthalif, K. U. Malik, and Ibrahim Benter, Christian Brothers University, Memphis, Tennessee (SM), and The University of Tennessee, Memphis, Memphis Tennessee (MM, KUM, IB).* Administration of deoxycorticosterone acetate (DOCA) to rats drinking 1% sodium chloride (NaCl) solution causes hypertension. The vasoactive agents produced are known to stimulate release of arachidonic acid (AA) from tissue phospholipids. The AA metabolites generated via cytochrome P-450 pathway mainly, 20-hydroxycortico-steronic acid (20-HETE) increase vascular tone, and stimulate Ras GTPase and mitogen activated protein kinase (Ras/MAPK). The purpose of this study was to determine if specific AA metabolites are involved in DOCA/NaCl induced hypertension in Sprague Dawley rats. Administration of DOCA to the rats (all animals in the study had an uninephrectomy) drinking 1% NaCl solution for five weeks increased mean arterial blood pressure (MABP), which was higher than rats treated with vehicle. Administration of the cytochrome P-450 (CYP-450) inhibitor aminobenzotriazole (ABT) reduced MABP, and infusion of farnesyl protein transferase inhibitor, FPT III, also decreased MABP. Data suggests one or more metabolites of AA formed through CYP-450, most likely 20-HETE, contributes to development of DOCA/NaCl hypertension probably by activating Ras via MAPK pathway.

AUTOGENIC BIOFEEDBACK TRAINING AS A POTENTIAL TREATMENT FOR PATIENTS WITH CHRONIC GASTRO-INTESTINAL PAIN. *Vinh Q. Dang, Hani Rashed, and Debra Reser, Christian Brothers University (VQD), and The University of Tennessee, Memphis, Memphis, Tennessee (HR, DR).* Gastrointestinal (GI) symptoms such as nausea, vomiting, abdominal pain, and dizziness or fainting are common in patients with motion sickness. In this study we evaluated a method called Autogenic Feedback Training (AFTE) developed by NASA to reduce GI symptoms experienced by astronauts in space travel. AFTE provides individuals with the ability to modulate their physiological response levels from their own resting baseline. We studied 10 patients (age 37 ± 3.8) before and after 4-6 sessions of AFTE. All patients had no known cause for their symptoms. In AFTE sessions conducted over an 8-10 week period, heart rate was utilized as a guide in measuring stress. Each session consisted of 30 min of training preceded and followed by 6 min of baseline. Autonomic function test and electrogastrogram were performed non-invasively as previously reported (GE 196:945-950, 1994). Nausea, bloating, abdominal pain, anorexia, and early satiety were quantified by the patient as 0 = no symptoms, 1 = mild, 2 = moderate, 3 = severe. Heart rate and blood pressure were measured as previously reported (Clin. Auton. Res. 7:93-96, 1997) and were analyzed by *t*-tests and expressed as mean \pm SEM. Data collected revealed that: 1) 60 % of all patients had improved as determined by total GI scores, and 2) All patients had improved in at least three of the measured parameters and were close to normal levels seen in healthy subjects. Our preliminary results suggest that AFTE could be a potential method in alleviating common GI symptoms in patients suffering from chronic motion sickness problems.

THE GEOMETRY OF THE HEART IMMEDIATELY FOLLOWING DEFIBRILLATION. *Stephen R. Smith, Brent Hoffmeister, and Robert A. Malkin, Rhodes College (SRS, BH) and The University of Memphis, Memphis, Tennessee (RAM).* While defibrillation is a very effective cure for ventricular fibrillation (VF), it is not known exactly how or why this electrical shock restores the heart's normal rhythms. Methods: A comparative study of dog hearts was performed to investigate changes in left ventricular geometry during defibrillation. Ten shocks were given at a determined defibrillation strength following 10 or 30 sec of VF. During this process, real-time ultrasound was recorded at a frame rate of 30 frames per sec. Left ventricular, cross-sectional area was measured for successful, failed, and backup shocks by digitizing the acquired ultrasound images and outlining the endocardium in each frame using imaging software. Results: Analysis of all 17 defibrillation events showed a 2.1 ± 0.6 fractional increase in area immediately following defibrillation. Conclusion: Defibrillation rapidly causes the left ventricle to double in area, suggesting that defibrillation synchronizes the cells to a relaxation state. This may indicate that the cells are simultaneously repolarized, and not depolarized during defibrillation.

CYTOKINE RESPONSE OF MACROPHAGES EXPOSED TO ORTHOPAEDIC IMPLANT PARTICLES. *Alfredo Narvaez, Steven J. Charlebois, and Richard A. Smith, Christian Brothers University, Memphis, Tennessee (AN), and The University of Tennessee, Memphis, Memphis, Tennessee (SJC, RAS).* The purpose of this study was to measure cytokine levels from macrophages exposed to particles of two orthopaedic implant materials. The cytokines measured (Interleukins-1b and -6, and Tumor Ne-

cross Factor- α) are known to be involved in osteolysis, a major contributor to orthopaedic implant failure. Macrophages are currently thought of as the major cellular mediator of osteolysis. A transformed mouse macrophage cell line (ATCC, IC-21) was cultured on glass cover slips coated with fibronectin in six-well tissue culture plates. Macrophages were exposed to cobalt-chrome or commercially pure titanium particles in a 1:1 cell/particle ratio. Zymosan and lipopolysaccharide (LPS) particles (10 μ /ml) were used as positive controls. After 24 h supernatants were assayed for cytokines. Cytokines from cells exposed to implant particles were 10–100 times lower than for the positive controls (LPS and Zymosan). Image analysis showed that the macrophages were highly associated with the particles. Confocal microscopy was used to confirm that the cells were engulfing the particles. Discrepancies between this work and previous studies, which have shown high levels of these cytokines in response to cobalt-chrome and titanium particles, may be due to endotoxins such as LPS adsorbed to their surface. A current hypothesis is that the particles, though sterile, may not be clean. The surface of these particles may contain adherent endotoxin that could trigger the high cytokine responses that have been observed in other in vitro studies.

MENSTRUAL CYCLE AFFECTS TILT-TABLE TESTS IN WOMEN. *Ash Rasoul, Judith Soberman, Pamela Jordan, and Matthew Robinett, Christian Brothers University, Memphis, Tennessee (AR), and The University of Tennessee, Memphis, Memphis, Tennessee (JS, PJ, MR).* Background: A previous study in the University of Tennessee Bowld's Cardiology Laboratory illustrated that there may be differences in tilt-table testing results due to cyclical hormonal variation in women. This study investigated this hypothesis with tilt table studies on women with normal menstrual cycles. Methods: Women, ages 18–35, with regular menstrual cycles and no previous history of syncope were randomly assigned to both a control (80 degrees) and either a premenstrual or preovulatory (70 degrees) trial. The test ended with either syncope or completion of protocol. Results: Approximately 1/3 of the control subjects tested experienced syncope. In the preovulatory trials, 1/2 of the subjects fainted. In the premenstrual trial, no fainting occurred. Conclusions: Cyclical variation in hormone levels due to the specific phase of the menstrual cycle can significantly affect the results of tilt table testing in women.

EFFECTS OF PRENATAL ALCOHOL EXPOSURE ON THE SIZES OF THE CORPUS CALLOSUM, HIPPOCAMPAL COMMISSURE, AND ANTERIOR COMMISSURE. *Uyen Vu, Dan Livy, and Andrea Elberger, Christian Brothers University, Memphis, Tennessee (UV), and The University of Tennessee, Memphis, Memphis, Tennessee (DL, AE).* Fetal alcohol syndrome (FAS) is a disorder associated with a pattern of behavioral, facial, and central nervous system abnormalities caused by alcohol consumption during pregnancy. Previous autopsy studies have indicated that one particular region in the brain, the corpus callosum, is especially susceptible to the toxic effects of alcohol. Recent studies using noninvasive resonance imaging techniques have found a decrease in corpus callosum area in humans. In this study, the sizes of the corpus callosum (CC), hippocampal commissure, and the anterior commissure were measured in Sprague-Dawley rats from prenatal and control treatment groups. Using a Kodak DCS 460 digital camera, images were taken of the mid-sagittal section. From these images, measurements were taken

with the analysis program Laserssharp. There was no significant difference observed in sizes between the alcohol-treated and control groups. Thus, these data suggest that other factors in addition to alcohol exposure may have contributed to the reduction in the CC seen in previous studies.

CORRELATES OF NURSING HOMES RESIDENTS' PAIN. *Y. H. Chan and Veronica Engle, Christian Brothers University, Memphis, Tennessee, and The University of Tennessee, Memphis, Tennessee.* Previous research has documented inadequate pain treatment of nursing home residents, especially Black residents. This study described the relationship of resident pain frequency and intensity with mental status, activities of daily living, depression, communication, and demographic characteristics. Data were collected from 104 residents as admitted sequentially to two large nursing homes serving indigent Black and White older adults. There were 74% Black and 52% male residents, with an average age of 68.4 (SD = 15.9) years. The federally mandated resident assessment instrument, the Minimum Data Set, was used to measure the study variables. Residents with better long-term memory ($r = -0.26$), or greater ability to feed themselves ($r = -0.23$), or who made negative statements about themselves ($r = 0.21$), or who had less education ($r = -0.21$) reported significantly ($P > 0.05$) more intense pain, and thus may be under-treated for pain. No variables were significantly correlated with pain frequency.

APPLICATION OF BIOFEEDBACK TRAINING DEVELOPMENT BY NASA IN TREATING PATIENTS WITH MOTION SICKNESS SYMPTOMS. *H. Rashed, P. Cowings, W. Toscano, T. Abell, D. Adl, F. Covington, C. Cornwell, R. Lutfi, M. Adl, D. Reser, and V. Dang, The University of Tennessee, Memphis, Memphis, Tennessee (HR, PC, WT, TA, DA, CC, RL, MA, DR), and LeMoyne-Owen College, Memphis, Tennessee (FC, VD).* Autogenic Feedback Training (AFTE) is a physiological conditioning procedure developed as a treatment for space motion sickness by NASA. This procedure provides individuals with the ability to modulate their physiological response levels from their own resting baseline levels, and improve specific symptoms. We studied 23 patients (age = 35 ± 3.8 years) with chronic problems of motion sickness referred for autonomic nervous system evaluation before and after 4–6 sessions of AFTE. AFTE was administered in 4–6 sessions, 30 min each, preceded and followed by 6 min of baseline, and divided into five cycles of alternating relaxation and stimulation (3 minute cycles). Autonomic function tests as well as the electrogastrogram for the enteric nervous system were performed as previously reported (GE 196:945–950, 1994). Gastrointestinal (GI) symptoms scores (SX) were quantified by standardized GI scores. Nausea, bloating, abdominal pain, anorexia, and early satiety were quantified as 0 = no symptoms, 1 = mild, 2 = moderate, 3 = severe. Results: After 4–6 AFTE, sessions, Autonomic Function Tests and SX revealed the following: 1) Vaso-cholinergic functions; 55 % of the patients had improved (IMP), 30 % had no change (NC), and 15 % had deteriorated (DT), 2) Sympatho-adrenergic functions; 30 % IMP, 50 % NC, and 20 % DT, 3) Vasomyogenic response to posture; 20 % IMP, 60 % NC, and 20 % DT, 4) Enteric Nervous System Functions; 40 % IMP, 40 % NC, and 20 % DT, 5) All the patients had IMP in at least three of the measured parameters, and 6) Total Symptoms Scores; 60 % IMP, 30 % NC, and 10 % DT. Conclusion: These data support the potential usefulness of AFTE in treating patients with upper gastrointestinal dysautonomia.