

ABSTRACTS OF PAPERS PRESENTED AT THE SPRING 1998 COLLEGIATE MEETINGS

EASTERN REGION

SOUTHERN ADVENTIST UNIVERSITY COLLEGE DALE,
TENNESSEE

STUDY OF THE HEALTH OF A CORAL REEF, SAN SALVADOR, BAHAMAS. *Larry Flack, Shannon Hamilton, and Niki McBryar, The University of Tennessee, Chattanooga, Chattanooga, Tennessee.* Over the past fifteen years coral reefs around San Salvador, Bahamas have been declining in health, with a decrease in some sea urchins and an increase in algae. During the late eighties and through the nineties several events of coral bleaching have occurred. Other factors contributing to the decline in health of the reefs around San Salvador include sewage dumping, land development, fishermen, divers, and anchor damage. Our research team chose a coral reef off the coast of Snow Beach, on the south side of the island of San Salvador. The south side has a low habitation of people and is not a popular dive location due to rough seas and shallow water. A series of dives were done to divide the reef into nine grids, which were observed for various types of fish, sea urchins, and corals. Four water samples also were taken at the site of the coral reef, and were tested for nitrates, phosphates, salinity, and conductivity. The reef was found to inhabit twenty-one fish species, one sea urchin species, and four coral species. The water samples contained no nitrates or phosphates. The salinity ranged from 31.9 to 33.2‰ and the conductivity ranged from 48 to 49.3%. No signs of bleaching or black band disease were noted on the reef. The overall health of the reef was determined to be good.

THE ECOLOGY OF A SEAGRASS BED AND INTERTIDAL ZONES IN GRAHAM'S HARBOR, SAN SALVADOR, BAHAMAS. *Leslie Anne Baccler, Elizabeth Ashley Brooks, Daniel Carpenter, Shawn Clouse*, Jennifer Jones, Dixie Sisk, and Charles Spurling, The University of Tennessee, Chattanooga, Chattanooga, Tennessee.* Intertidal and subtidal habitats were studied in Graham's Harbor on San Salvador Island, Bahamas. The study was conducted to compare macrophyte and fish communities occurring in the two habitats. Data collected included counts of macroalgal species, estimated percent cover of seagrass, water chemistry, and fish counts. The intertidal habitat differed from the subtidal by depth, substrate, and the lack of a seagrass population. The abundant algal species in the intertidal zone were *Derbesia vaucheriaeformis*, *Padina sanctae-crucis*, and *Dasycladus vermicularis*; no fish were observed. Dominant algal species in the subtidal zone were *Halimeda incrassata*, *Halymenia floridana*, and *Penicillus capitatus*. The subtidal seagrass species were composed primarily of *Thalassia testudinum* and *Syringodium filiforme* with an abundant fish community dominated by *Malacanthus plumieri*. Water chemistry done at the site showed no significant levels of nutrients and a constant pH. The two zones support unique communities that vary from each other in species diversity, plant composition, and substrate type. Algal

species dominant in the intertidal zone were not the dominant algae in the subtidal zone. The intertidal zone did not have a visible fish or seagrass community due to the differences in water depth and substrate type.

A HOLISTIC COMPARISON OF WATER QUALITY ON THE PIGEON RIVER ABOVE AND BELOW THE CHAMPION INTERNATIONAL PAPER MILL. *Katherine M. Groves, Maryville College, Maryville, Tennessee.* Three sites on the Pigeon River were selected for sampling on seven dates throughout the summer of 1997. The first was approximately 0.8 km upstream from the Champion International Corporation mill in Canton, North Carolina. The second was approximately 0.8 km downstream of the mill. At each site on each sampling date the pH, oxygen concentration, temperature, and color absorbance were determined. The benthic macroinvertebrate community was sampled using a modified Invertebrate Community Index (ICI). The results show that the water at Site 2 was slightly more basic, had a higher temperature, and a higher color absorbance value than the water at Site 1. The ICI values indicate the community downstream from the mill is depauperate. However, none of the physical parameters measured accounted for the extremely depressed macroinvertebrate population that exists below the mill. In all probability, the community is degraded because it received Bleached Kraft Mill Effluent from the Champion International Pulp and Paper mill.

ACID MINE STUDY OF HOGSKIN BRANCH AND CHICKAMAUGA GULCH WATERSHEDS. *Tom Bowen, The University of Tennessee, Chattanooga, Chattanooga, Tennessee.* There is a need in the North Chickamauga Creek watershed for observation and remediation of old strip mine sites. The sites of interest are Hogskin Branch and Chickamauga Gulch. These sites were chosen due to lack of acid mine drainage data. Hogskin Branch and Chickamauga Gulch are located along Canyon Rim road on Mobray Mountain. The access road passes through the Newton Sandstone and the Whitwell Shale. The Whitwell Shale contains two mineable coal seams, the Sewanee and the Richland. Analyses of the aquatic levels of pH, conductivity, dissolved oxygen, aluminum, iron, and zinc from June 1, 1997 to May 1, 1998 at the Chickamauga Gulch and Hogskin Branch sites have shown that there is a significant acid mine drainage problem at these sites. A consistently low pH, low dissolved oxygen, high conductivity, and presence of the metals in the water show the Hogskin Branch sites to be the most problematic areas. All of the parameters tested are harmful to aquatic life. The Hogskin Branch sites range from 20 to 50% higher than the Chickamauga Gulch sites for all parameters tested.

EFFECT OF WATER-SATURATED SOIL ON THE BIOMASS OF *RUMEX CRISPUS*. *Jennifer White* and John Perumal, Southern Adventist University, Collegedale, Tennessee.* *Rumex crispus* (curled dock), of family Polygonaceae, is a common pe-

rennial that grows in a wide variety of habitats. Previous studies have shown that *Rumex crispus* has several physiological adaptations to various water regimes, which may account for its field distribution. The purpose of this experiment was to determine the effect of various amounts of water in the soil on the biomass of the plant. This greenhouse experiment involved six different soil treatments on a soil saturation continuum, from dry to complete soil saturation. The results from leaf area readings and total biomass weight showed significant differences between the treatments. Plants with slightly saturated soil had the highest biomass and greatest leaf area, while plants with the most saturated soil had the least biomass and smallest leaf area.

ANALYZING SEED PRODUCTION AND GERMINATION IN *PITYOPSIS RUTHII*. *Jennifer Park* and John Perumal, Southern Adventist University, Collegedale, Tennessee.* *Pityopsis ruthii* (Ruth's Golden Aster), currently listed as an endangered species by the State of Tennessee and the United States Fish and Wildlife Service, is a perennial plant belonging to the family Asteraceae. Due to its declining population and distribution, there has been a renewed interest in studying the species. In a previous study, the focus was on better understanding the species within its environmental niche. In the previous study conducted in 1996, it was determined that *P. ruthii* was affected by a high number of nonviable seeds, a large occurrence of eaten seeds, and a low percentage of germination. In this present study, the focus has been extended to conduct a more in-depth investigation on the seed set of *P. ruthii*. From September 12 to November 7, 1997, a total of 190 flower heads (a sample population of 9273 seeds) were collected from the Hiwassee River site, analyzed and characterized. Seeds were characterized as follows: 1) flat, 2) round, 3) immature, 4) eaten, and 5) non-categorized. Germination was attempted on randomly selected seeds. The present study has shed a tiny portion of light on some exciting details associated with *P. ruthii*. However, much still remains unknown. Thus, an approach to understanding the "smaller" details can create a bridge to understanding the larger environmental system. This presentation hopes to ignite a renewed interest in a dying species.

PERCENT GERMINATION AND SHOOT GROWTH IN *DAUCUS CAROTA*. *Norman McNulty* and John Perumal, Southern Adventist University, Collegedale, Tennessee.* *Daucus carota* is a common wildflower in the southeastern United States found along roadsides and in fields. This project, determined if seed size affected germination rate. After germination, the rate of shoot growth was noted. The hypothesis was that the larger the seed size, the greater the rate of germination. It also was hypothesized that the shoots that germinated from the larger seeds would grow faster, and that they would grow to be larger with more flower stalks. Data were collected from two separate experiments in which *D. carota* seeds were germinated. In both experiments, the largest seeds had the highest rates of germinations. Shoots that germinated were grown over a four month period, and the rate of growth and plant development was not affected by the size of the seed. In conclusion, seed size does not affect the percentage of germinations among seeds in *D. carota*. However, once the seed has germinated, the size has little or no effect on the growth and shoot size.

SUBSURFACE DISTRIBUTION OF COAL SEAMS IN THE PENNSYLVANIAN WHITWELL SHALE, SOUTHEASTERN MOUNT AIRY QUADRANGLE, BLEDSOE AND SE-

QUATCHIE COUNTIES, WESTERN WALDEN RIDGE (CUMBERLAND PLATEAU), TENNESSEE. *Richard E. Bergenback and Paul E. David, The University of Tennessee, Chattanooga, Chattanooga, Tennessee.* Borehole exploration for mineable coal seams in the subsurface Pennsylvanian Whitwell Shale is located on the western limb of the Walden Ridge syncline (Sale Creek mini-basin) in southeastern Mt. Airy quadrangle. Deep mining is precluded and strip mining is questionable because of thin, laterally discontinuous coal seams as well as lateral thickness variation of thin seams. Thickness of overburden and relatively high cost of sandstone overburden removal also are probable prohibitive factors.

PENNSYLVANIAN CYCLIC DEPOSITION IS EVIDENCED BY A FLOODPLAIN-COAL SWAMP-MARINE ORTHOQUARTZITE SEQUENCE (SEA HIGHSTAND) CONTAINED WITHIN THE MAIN BODY OF THE QUARTZ ARENITE-BRAIDED STREAM: WARREN POINT SANDSTONE (SEA LOWSTAND) EXPOSED IN A ROADCUT ON WALDEN RIDGE (CUMBERLAND PLATEAU), SOUTHEASTERN TENNESSEE. *Richard E. Bergenback and Chris Chaffin, The University of Tennessee, Chattanooga, Chattanooga, Tennessee.* A road cut exposure of the Pennsylvanian quartz arenite-rich, braided stream deposit of the Warren Point Sandstone, along Route 27, Ketner Gap Quadrangle, Walden Ridge (Cumberland Plateau), southeastern Tennessee contains a single, unique sedimentational sequence of a graywacke-rich floodplain deposit which grades laterally to a coal swamp unit, which, in turn, overlies a marine orthoquartzite. It is suggested that the main body of the Warren Point is associated with a low stand of sea level and that units contemporaneous with the coal swamp unit were formed during a sea level high stand. Thus, it is considered that these Warren Point sedimentational units evidence cyclic deposition.

INTERACTION OF ET-18-OME AND AD32 WITH LEUKEMIA CELLS. *John Finney and Stephen Wright, Carson Newman College, Jefferson City, Tennessee.* ET-18-Ome and AD32 are potent anticancer agents, which have not been tested for their effects when combined. We examined the combination of these drugs on the growth of cultured human CCRF-CEM and K562 leukemia cells. Both drugs inhibited CEM cell growth with respective fifty percent inhibitory concentrations calculated to be 2.8 μ M and 2.4 μ M. K562 cells were found to be less sensitive to AD32 and resistant to ET-18-Ome with only 18% control cell growth inhibition observed at 6 μ M. Used in combination, the two drugs acted synergistically against the CEM line and antagonistically against the K562 line. The order of introduction of the drugs when used in combination against the CEM line was found to be insignificant. This is the first reported use of this combination of drugs and the results suggest this may have therapeutic use.

A QUALITATIVE ANALYSIS OF LARVAL *DROSOPHILIA MELANOGASTER* MITOCHONDRIAL DNA VIA THE POLYMERASE CHAIN REACTION. *Jason Gatling* and Joyce Azevedo, Southern Adventist University, Collegedale, Tennessee.* Mitochondria contain their own circular genome, which undergoes spontaneous deletions over the lifetime of the organism in eukaryotes as diverse as fungi, *Drosophila* and humans. Previous research has indicated several "hot-spots" where deletions have occurred leading to various muscular myopathies and contribut-

ing to the senescence process of various organism. In order to develop *Drosophila* as a model genus for these studies, the purpose of this project was to optimize the "Polymerase Chain Reaction" (PCR) parameters for the amplification of a small region from the larval *Drosophila melanogaster* mtDNA genome.

CONTAMINATION OF DRINKING WATER BY *GIARDIA LAMBLIA* AND *CRYPTOSPORIDIUM PARVUM* NEAR SHELTERS ALONG THE APPALACHIAN TRAIL IN THE GREAT SMOKY MOUNTAINS NATIONAL PARK. *Aaron Damrill, Maryville College, Maryville, Tennessee.* This research investigated the levels of *Giardia lamblia* and *Cryptosporidium parvum* in drinking water sources at 4 shelters along the Appalachian Trail in the Great Smoky Mountains National Park. Specifically, the water sources were the springs located near these shelters. At each site 20 to 30 liters of water were pumped across a filter and then returned to the spring. The filter was returned to the lab where it was washed to remove the oocysts and cysts. They were then stained with fluorescent antibodies and counted with an epifluorescent microscope according to the protocol set forth by the Environmental Protection Agency Microbiology Research Division. Preliminary results indicate that *Giardia* cysts and *Cryptosporidium* oocysts are present in the springs.

A STUDY OF COLIFORM OF WELLS IN TWO SMALL NICARAGUAN INDIAN VILLAGES. *Suzanna L. Swilley* and Stephen A. Nyirady, Southern Adventist University, Collegedale, Tennessee.* The need for safe, potable water is a vital necessity for health and wellness. Meeting this need can be a challenge in developing countries where standards of sanitation & hygiene are low. This study reports the incidence of coliform contamination in shallow wells in two Miskito Indian villages in northeastern Nicaragua. The water was evaluated using the KONFIRM presence/absence water test as well as by biochemical tests for coliforms in the laboratory. Eight of the ten (80%) wells sampled in one village & nine of the twelve (75%) wells sampled in the other village tested positive for coliform contamination. These results strongly suggest the need for measures to be taken to provide safe drinking water for these communities.

THE ADHERENCE OF *STAPHYLOCOCCUS AUREUS* AND *STREPTOCOCCUS SALIVARIUS* TO RESIN COMPOSITES. *Arturo Lopez*, Roger Hall, and L. Ann Foster, Southern Adventist University, Collegedale, Tennessee.* Resin composites were chosen for anterior esthetic restorative dental procedures. Breakdown areas between cavity preparations and restorative materials can provide potential reinfection by *Streptococcus salivarius*, *Staphylococcus aureus*, and other bacteria. The adherence of *S. salivarius* and *S. aureus* to resin composites, APH-Caulk, Charisma-B30, Herculite-Kerr, Silux-3M, and Z-100 3M was determined using an in vitro model. Composite resins were mounted on glass slides and exposed to bacteria suspended in tryptic soy broth (1×10^6 /ml) for 4, 8, and 12 h at 37 °C. Bacterial adherence was determined microscopically after the samples were Gram stained. Both bacterial strains were able to adhere to resin composites, and the number of bacteria adhering to each composite differed. The Z-100 composite had the most adherence overall. The Herculite composite had the least amount of adherence. Herculite composite resin was thought to be the best composite resin tested to be used in esthetic restorative dental procedures.

ANTIBIOTIC SUSCEPTIBILITY PATTERNS OF GROUP A BETA-HEMOLYTIC STREPTOCOCCI ISOLATED FROM CASES OF PHARYNGITIS AT A RURAL MEDICAL CLINIC IN COLLEGEDALE, HAMILTON COUNTY, TENNESSEE. *Amanda Kristine Winters*, Stephen A. Nyirady, and David Winters, Southern Adventist University, Collegedale, Tennessee (AKW, SAN) and Collegedale Medical Center, Collegedale, Tennessee (DW).* This study was undertaken to determine if a common community ailment such as streptococcal pharyngitis could be treated effectively with low cost antibiotics such as Penicillin G. Beta hemolytic Group A streptococci were isolated from all consenting patients with streptococcal pharyngitis at a rural medical clinic in Hamilton County, Tennessee. The isolates were tested by the Kirby-Bauer disk susceptibility method for resistance to six commonly prescribed antibiotics ranging in cost from \$7.00 to \$70.00 for a full course of treatment. Twenty-six cultures were studied over a seven-week period. All antibiotics proved effective in killing the Group A streptococci. The findings of this research question the necessity of using high priced broad-spectrum antibiotics as a first line treatment for appropriate clients presenting with streptococcal pharyngitis in the community studied.

SIZE THRESHOLD FOR SYMPTOMATIC BRAIN METASTASES. *John M. Craig*, Allan F. Thornton, and John W. Hennessy, Southern Adventist University, Collegedale, Tennessee (JMC), and Massachusetts General Hospital, Boston, Massachusetts (AFT, JWH).* To determine whether a size threshold for symptomatic brain metastases could be defined, the clinical presentation and initial magnetic resonance imaging (MRI) scans were reviewed for 61 patients with brain metastases from solid tumors who were referred to Massachusetts General Hospital for radiation therapy. Metastases 5 mm or less in diameter were detected in 18 of 61 patients (30%) on an initial MRI; all 18 patients also had other larger metastases. In 24 patients with a single metastasis and neurological symptoms, the lesion was 10 mm in diameter or larger in every case. In 26 patients with neurological symptoms and multiple metastases, 25 had at least one lesion that was 10 mm or larger in diameter. In addition, the symptomatic lesion could be identified in 21 of 26 patients, and in every case symptoms were localized to a lesion over 10 mm in diameter. These findings suggest that 1 cm is an approximate threshold size for the production of symptoms by a brain metastasis.

POSTOPERATIVE INFECTION RATES WITH INSTRUMENTED LUMBAR FUSION: A RETROSPECTIVE REVIEW OF 129 CONSECUTIVE CASES. *Nicole G. Kurzynske*, Scott D. Hodges, Stephen C. Humphreys, Jason C. Eck, and Laurie C. Covington, Southern Adventist University, Collegedale, Tennessee (NGK), and Chattanooga Orthopaedic Group, Foundation for Research, Chattanooga, Tennessee (SDH, SCH, JCE, LCC).* The use of internal fixation devices in spinal surgery is common to achieve reduction, maintain alignment, and stabilize the spine while fusion occurs. Infection rates of less than 2% (0–2%) were reported in the late 1960's without the use of instrumentation. Reported rates of infection following instrumented fusion are generally around 6% (range 0–11%). The purpose of this study was to retrospectively review the incidence of postoperative infection following instrumented spinal fusion to determine if infection rates are related to patient type and surgical procedure.

RHEUMATOID ARTHRITIS: THE CRIPPLING DISEASE. *Shannon Jo Bartlett, Lee University, Cleveland, Tennessee.* Rheumatoid arthritis is an autoimmune disease that attacks the joints of the body. Fifty million people suffer from this disease worldwide. It affects women more than men in a 3:1 ratio. It usually strikes between the ages of thirty-five and fifty-five. The general symptoms in the beginning are fatigue, low-grade fever, and anemia. Systemic pain in the joints quickly follows. Soon the tissue in the joints becomes thickened due to the accumulation of synovial fluid and inflammation. Eventually the disease destroys the cartilage and as a result crippling deformities occur.

DISCITIS FOLLOWING MICRODISKECTOMY: A PRELIMINARY REPORT ON THE ROLE OF PRE-OPERATIVE PROPHYLACTIC ANTIBIOTICS. *Stacey McClarty* and Scott D. Hodges, Southern Adventist University, Collegedale, Tennessee.* Eighty-three consecutive microdiskectomies were performed and evaluated to discern the efficacy of pre-operative prophylactic antibiotics (Cefazolin and Vancomycin). The objective of this preliminary report was to evaluate the amount, time of administration, effectiveness, and need for prophylactic antibiotics using our surgical results. Previous studies have yielded conflicting results regarding the role of antibiotics in prevention and treatment of discitis, and in their ability to penetrate the intervertebral disc. One gram of Cefazolin was intravenously administered to 76 patients, 30 minutes prior to incision; 500 mg of Vancomycin was likewise administered to the remaining 7 patients who were allergic to cephalosporins. No post-operative antibiotics were administered. Of the 83 consecutive surgeries, no patient developed iatrogenic discitis. The average length of follow-up was 6 months (range 1-23 months). Our results suggest that the use of cephalosporins (and glycopeptides) seems to prevent discitis when intravenously administered 30 minutes prior to surgery; that being the case, there appears to be no advantage in additional post-operative dosing. However, in light of conflicting reports and the preliminary nature of this study, conceivably there is another explanation. Perhaps there is in fact no correlation between pre-operative antibiotics and post-operative discitis.

EXPLANATIONS OF STARING PERCEPTION. *Jarred Younger, Maryville College, Maryville, Tennessee.* This study attempts to explain the possible mechanisms of staring detection in humans. Many studies place the percentage of people believing they can detect the gaze of others at 68 to 86 percent. Very few studies have been directed at explaining this phenomenon. The three major theories and their application in both laboratory and field experiments are examined. Study one focuses on physiological (GSR) reactions to staring. Twenty-six participants performed a mock experiment while under alternating staring and non-staring phases. Study two examines behavioral reactions to staring in the classroom setting. Independent judges rated filmed nervous behaviors. Results will be discussed in relation to different perceptual theories.

EFFECTS OF FEEDING, TIME OF DAY AND SEX ON TEMPERATURE SELECTION BY MIDLAND BROWN SNAKES. *Lauren Fehr, Maryville College, Maryville, Tennessee.* I studied the effects of feeding on thermoregulation in the Midland Brown Snake (*Storeria dekayi*). I performed a behavioral study of temperature selection using two linear thermal gradients. The substrate temperature at each snake's location was measured with a thermistor. Overall, the mean temperature selected by 12 snakes

was 28.2 °C. Feeding did not have a significant effect on substrate temperature selection. Temperatures selected after 6 days of fasting did not differ from those selected shortly after refeeding ($P = 0.904$). Further, temperatures selected immediately after feeding did not differ from temperatures selected after two additional days of fasting ($P = 0.143$). The results support the hypothesis of Touzeau and Sievert (1993) that snakes preferring temperatures of 28 °C or above do not select higher temperatures after feeding. Other factors that significantly affected temperature selection included time of day and sex. The snakes selected significantly higher temperatures later in the day (3:35 to 8:25 PM) than earlier (9:30 AM to 1:10 PM). Females selected significantly higher temperatures than males (29.5 °C vs. 26.1 °C).

THE EFFECTS OF UVA AND UVB LIGHT ON ELASTIN TISSUE. *Stacy Kerr, Maryville College, Maryville, Tennessee.* This study focuses on the changes that occur to the elastin tissue properties after in vitro exposure to simulated solar radiation. In the procedure, elastin tissue from the neck ligaments of cow was exposed to ultraviolet radiation (302 nm and 365 nm). After irradiation the tissues were examined histologically and subjected to tensile strength measurements. This research examined the alterations in the physical characteristics of the tissue. The experiment demonstrated the dangers of over exposure to the sun and also provided adequate proof of the consequences of excessive burning. Overall, this experiment will allow one to understand the harmful effects sun exposure can inflict on the skin, a vital part of the human body. When exposed to the ultraviolet light, the fibers no longer remain parallel due to the photolysis of the desmosines. The elastic fibers become coiled and twisted and are no longer able to function properly. Their primary role in aiding in flexibility is demolished once fragmentation occurs. Therefore, the more fragmentation, the greater the reduction in flexibility of the fibers.

DOES MUSIC OR MOOD IMPROVE MEMORY? *Larry Brad Smith, Maryville College, Maryville, Tennessee.* The purpose of this experiment was to investigate the effects of mood and/or music in four different learning conditions. Forty subjects, 31 female and 9 male, were recruited mostly from introductory psychology courses in which the participants received extra credit. Each participant was assigned to one of four conditions. No Music, Music Prior, Music During, and a Combo Group (music during study time and music prior to taking the test). Each participant was asked to read a passage and then take a short-answer test based on the reading the next day. Statistical test results indicated significant differences between all conditions and the Combo Group, while no other significant differences between groups were noted. Therefore, experiencing music during study time as well as prior to taking the recall test facilitated retention of the learned material. The results are discussed in reference to practical applications to test-taking strategies.

EFFECTS OF INTERACTION OF CAFFEINE AND NICOTINE ON CARDIOVASCULAR REACTIVITY IN BORDERLINE HYPERTENSIVE RATS. *Todd J. Smith, Maryville College, Maryville, Tennessee.* Borderline hypertensive rats were used to test chronic use of caffeine, nicotine, and their combination as risk factors for hypertension. For a period of ten weeks, eight rats were administered caffeine (20 mg/kg), nicotine (0.4 mg/kg), both drugs, or placebo orally through a 10 ml saccharine solution. Systolic blood pressures were monitored each week and

field test behavioral data were recorded three times during the experiment. A 4×6 analysis of variance of drug group with repeated measures revealed a statistically significant difference among drug groups. Post hoc *t*-tests revealed that the mean systolic blood pressures of all experimental groups were higher than the control group. This indicates that both drugs contribute to the attainment of hypertension in rats that are genetically engineered to mimic borderline hypertension in humans. There was no difference, however, in the effects of the two stimulants over time or their interaction. The implications of these findings for human hypertension are discussed.

THE EFFECTS OF IN-ROOM HUMIDIFICATION ON RESPIRATORY HEALTH OF COLLEGE DORMITORY STUDENTS.

Steven E. Lucas*, **J. Veenstra**, and **M. W. Riley**, *Lee University, Cleveland, Tennessee*. The purpose of this study was to determine if the use of in-room humidifiers could reduce symptoms of upper-respiratory distress common among college dormitory students. One hundred and forty-three students were divided into two groups. The experimental group (72 students) were provided with humidifiers and instructed on their proper use. The control group (71 students) was instructed to refrain from the use of any in-room humidifiers. Students were interviewed weekly to determine symptom severity of ten manifestations of upper-respiratory distress (0 = not present, 1 = slight symptoms, 2 = moderate symptoms, 3 = marked symptoms). Collective totals were compared using the *t*-test for independent samples. The experimental group had a significantly lower score than the control group (9.61 vs. 14.66). In addition, the experimental group visited medical facilities less than one-fourth as frequently as the control group for upper respiratory symptoms.

TOXOPLASMOSIS AND ITS EFFECTS ON THE HUMAN FETUS.

Kelly Conn, *Lee University, Cleveland, Tennessee*. *Toxoplasma gondii* is an amoebic parasite with little host specificity, infecting over 200 species of mammals and birds. There are two known strains of the parasite. This protozoan causes the disease toxoplasmosis. The life cycle is definitive only in the feline. There are three infective stages of *Toxoplasma*: pseudocysts, tissue cysts, and oocysts. There are many precautions that can be taken to prevent infection of the parasite. In humans, an infection of toxoplasmosis is classified as acute, sub-acute, or chronic. When a pregnant woman acquires the protozoan during pregnancy, it poses a great risk to the fetus. Congenital toxoplasmosis can result in spontaneous abortion, severe disease, or sub-clinical disease. There are several methods of testing for toxoplasmosis in both mother and fetus. There also are several methods of chemotherapy that can be used during pregnancy and after birth for the mother and child. Routine screening for toxoplasmosis as a method of prevention of congenital toxoplasmosis is accepted globally. However, the United States does not routinely screen pregnant women for the parasite.

MIDDLE REGION

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SIZE-CLASS STRUCTURE OF SOME OLD-GROWTH FORESTS, KENTUCKY AND TENNESSEE. **Sandra J. Gonzalez***

and **Edward W. Chester**, *Austin Peay State University, Clarksville, Tennessee*. Published data from five reputedly old-growth forest stands on the Northwestern Highland Rim, Kentucky and Tennessee, were used to develop size-class profiles for each. Frequency of occurrence was plotted against size-classes to determine if the data matched the expected J-shaped curve characteristic of old growth, all-aged stands. In addition, the size-class distribution of oaks was plotted separately to determine the status of this genus in the five oak-dominated forests. Stands examined were from Greenwood Forest (Christian County, Kentucky), Cross Creeks National Wildlife Refuge (Stewart County, Tennessee), St. Stevens Church woodland (Lyon County, Kentucky), Devil's Backbone (Stewart County, Tennessee), and chestnut oak dominated stands from Lyon and Trigg counties, Kentucky, and Stewart County, Tennessee. In all cases, when size classes were plotted against frequency of occurrence, a J-shaped curve was obtained. However, oaks were inadequately represented in lower size-classes in Greenwood Forest and St. Stevens Forest, indicating that future forests on those sites may not be oak dominated.

GRAPH COLORING WITH HYBRID GENETIC ALGORITHMS.

Mark C. Ginn and **David G. Lindsey***, *Austin Peay State University, Clarksville, Tennessee*. An assessment of the performance of a hybridized genetic algorithm on the vertex-coloring problem includes the use of Tabu Search, local optimization methods, and Monte Carlo methods. Results of test runs on a few of the usual test graphs will be included.

VASCULAR FLORA OF THE UPPER CUMBERLAND PLATEAU: ALKALOID SCREENING PRELIMINARY RESULTS.

Felix G. Coe and **Meredith L. Moore***, *Tennessee Technological University, Cookeville, Tennessee*. As part of a larger study of the useful plants of Tennessee, a total of 188 species representing 95 genera and 48 families of the Upper Cumberland Plateau were assayed for the presence of alkaloids. Specimens tested for alkaloids were collected randomly from among targeted plant families-known to contain alkaloids, and from the local ethnobotanical lore-plants used in folk medicine. Specimens were tested for alkaloids with Dragendorff's reagent; 80 contained alkaloids. The results show that 43% of the species tested have at least one alkaloid. It is suspected that wetland habitats will contain the highest number of alkaloid containing species.

COMPARISON OF TERRITORIAL AGGRESSION BETWEEN DEVELOPMENTAL STAGES IN THE DAMSELFISH *MICROSPATHADON CHRYSURUS*.

J. W. Staggs* and **Jim Carpenter**, *Lipscomb University, Nashville, Tennessee*. Territorial aggression among coral reef fishes is believed to occur so that the environment and its resources will be available for continued survival of the individual. Intensity of conspecific attacks among damselfish is believed to be related to developmental stage, three of which are easily identifiable. The mature fish may be more confident than a younger fish of attaining a larger territory containing a greater abundance of resources. We hypothesized that damselfish developmental stage would be inversely related to increasing aggressive behavior. Subjects were presented with an exact conspecific rival by placement of a mirror near the defender and aggressive behaviors were recorded at one-minute intervals. Recorded behaviors, in increasing order of aggressiveness, were passes, lateral displays, bites, and attacks. Juveniles had significantly more mean bites per minute than did the other two groups.

Adults had significantly more mean passes per minute than either juveniles or intermediates. An unexpected finding included a total body color change as the initial response of all subjects to the introduction of an intruder. In conclusion, the findings suggest that damselfish display decreasing aggressive behavior as age increases. In addition, presentation of an exact conspecific rival can be made by use of a mirror. This study is the first to report color change as a universal initial response of the yellowtail damselfish to a conspecific rival. Future research should include a larger study population, longer observation time, an improved method for quantifying aggressive behavior, and further refinement of the continuum of aggressive behaviors.

POLYMERASE CHAIN REACTION ANALYSIS OF PHASE VARIATION OF TYPE 1 FIMBRIAE IN *ESCHERICHIA COLI*. *Rebecca Downs**, *Jon H. Lowrance*, *E. V. Sokurenko*, and *David L. Hasty*, *Lipscomb University, Nashville, Tennessee (RD, JHL)*, and *The University of Tennessee, Memphis, Memphis, Tennessee (EVS, DLH)*. *Escherichia coli* expression of type 1 fimbriae, a major virulence factor, is subject to phase variation controlled by an invertible 314 bp element upstream from the *fimA* gene. Orientation of the *fimA* promoter within this invertible element is one factor determining whether bacteria are fimbriated (ON) or nonfimbriated (OFF). Previous data demonstrated that *HinfI* restriction analysis of PCR products could identify whether the switch was "ON" and/or "OFF". In this study, we extended the *HinfI* restriction analysis of polymerase chain reaction (PCR) products from samples obtained during a standard growth curve. We determined that the *fimA* switch is "OFF" during early log phase and both "ON" and "OFF" by the stationary phase. These data indicate that fimbriation or continued fimbriation is less necessary in early log phase and may relate to the time course of *E. coli* adherence to host tissue.

BINDING OF R17 RNA PHAGE TO F PILI OF *ESCHERICHIA COLI*. *C. Ryan Beck** and *Robert T. Grammer*, *Belmont University, Nashville, Tennessee*. Bacteriophage R17 infects its host *Escherichia coli* by binding to F pili and injecting RNA through an unknown mechanism. Therefore, infection does not occur in those cells lacking F pili. It is understood that the F pili that project out away from the *E. coli* are the site of R17 attachment. However, the next step in the infection process, following this attachment, is unknown. Some published results suggest that the F pili shorten, bringing R17 within close vicinity of the *E. coli* outer membrane. Infection then occurs with RNA injection. The shortening of F pili was investigated by electron microscopy.

PURIFICATION AND CAPSID ASSEMBLY OF R17 PHAGE BY GEL FILTRATION COLUMN CHROMATOGRAPHY. *Cory Barnett** and *Robert T. Grammer*, *Belmont University, Nashville, Tennessee*. In order to properly monitor studies of bacteriophage R17 such as molecular weight determination, conditions for self-assembly, crystallization, and determination of three-dimensional structure, it is often necessary to purify the phage. Most past research involving phage required use of an ultracentrifuge and separation using a CsCl gradient for purification. This is a timely procedure, which involves expensive equipment and results in loss of viability of the phage due to removal of the bacteriophage A-protein necessary for adsorption for the phage. A method was investigated to purify R17 using gel filtration column chromatography. According to previous research, the molecular weight of R17 is 3.6×10^6 daltons with a

diameter of 250 Angstroms. This knowledge led us to run the phage over a Bio-Gel A-15m gel matrix (fraction range: 40,000 to 15,000,000 daltons) in order to purify the phage by separating it according to its size. This method would allow for a gentle purification, lessening the loss of viability without removal of the A-protein. Phage purification was monitored by serial titration, ultraviolet spectrum analysis, and protein assay using Bradford's reagent. Purification of phage gave an ultraviolet spectrum that was very representative of previous research of pure phage. The fraction elution curve also was very representative of separation of phage particles. Recovery of particles after column was 33%, and recovery of infectivity was 5.7%. Using the purified phage, coat protein was extracted, denatured, dialyzed into $KC_2H_3O_2$ at different temperatures and ideal temperature for capsid self-assembly was investigated by ultra violet analysis and protein assays.

MEASUREMENTS OF PRIMARY PHOTOCHEMISTRY AS AN INDICATOR OF THE PHYSIOLOGICAL STATUS OF GREEN ALGAE. *Lillian F. Barber**, *Rhiannon Harris*, *Valeria J. Lotridge*, *Philip T. McCord*, and *Jefferson G. Lebkuecher*, *Austin Peay State University, Clarksville, Tennessee*. The problems associated with measuring primary photochemical reactions of algae in an aqueous environment were addressed and the best methodologies determined. Cultured *Selenastrum capricornutum*, a unicellular green alga, was suspended in a vial containing 200 μ l of buffered reaction mix. The algae were placed in darkness for 5 min to allow the oxidation of primary electron acceptors. A two-second pulse of saturating irradiance was used to initiate photochemistry. The resulting long-wavelength energy emitted as chlorophyll a fluorescence was used to measure resonance-energy transfer through the pigment beds and the reduction of primary electron acceptors. The results demonstrate that this method can be used to evaluate algal primary photochemistry in an aqueous environment.

RANDOMLY AMPLIFIED POLYMORPHIC DNA ANALYSIS OF RELATEDNESS AMONG FOUR SPECIES OF THE CACTOPHILIC YEAST GENUS *PICHIA*. *K. C. Hillsman** and *P. F. Ganter*, *Tennessee State University, Nashville, Tennessee*. Cactophilic yeast strains from the *Pichia opuntiae* species group (*P. thermotolerans*, *P. hemmanti*, *P. antillensis*, and *P. opuntiae*) were tested for genetic relatedness by random amplified polymorphic DNA (RAPD) analysis using four random primers. Strains of yeast were grouped according to the patterns of RAPD bands generated. Parsimony analysis indicated that many yeast strains were misclassified. Subsequent re-identification confirmed that some strains were not part of the *P. opuntiae* group. When the misclassified strains were removed, the results altered the hypothesis that *P. thermotolerans* was the youngest of the species in its group but confirmed that it is derived from *P. opuntiae*. RAPD analysis proved to be a valuable tool in classifying and understanding the phylogeny of yeasts.

RANDOMLY AMPLIFIED POLYMORPHIC DNA ANALYSIS OF CACTOPHILIC YEAST FROM *PICHIA AMETHIONINA* GROUP. *Vanessa Williams**, *Philip Ganter*, and *Bryan Quarles*, *Tennessee State University, Nashville, Tennessee*. DNA from strains of cactophilic yeast from the *Pichia amethionina* group (*P. caribaea*, *P. amethionina* var. *amethionina*, and *P. amethionina* var. *pachycereana*) were analyzed by banding patterns using randomly amplified polymorphic DNA (RAPD) analysis. Taxo-

omic work has revealed these species to be closely related based on physiological characteristic, DNA homology, and geographic distribution. Results indicated that strains of yeast identified as physiologically related are not necessarily related genetically. These species, belonging to the same genus, exhibited high levels of RAPD variation and little variation in physiological abilities. RAPD analysis indicated one group physiologically identified as *P. caribaea* from *Stenocereinae* host plants was more related to strains of *P. amethionina* var. *pachycereana* than to other strains identified as *P. caribaea* but from *Opuntia* hosts. No evidence was found for a distinct variety from Australia. Fermenting strains of *P. amethionina* from Argentina and Texas formed a unique cluster that was most closely related to *P. caribaea* and may be a new variety or species.

INTERACTIVE ENTOMOLOGICAL GRAPHIC KEY. *Scott Allen* and Larry Latson, Lipscomb University, Nashville, Tennessee.* A Windows-based interactive multimedia entomological graphic key was developed using Asymetrix Corporation ToolBook authoring software. Insect specimens of thirteen different insect orders were collected and photographed. Insect photographs were obtained using a Minolta X370 camera and macrophotography equipment. Photographs of selected insect taxonomic features were scanned using a Hewlett Packard ScanJet IICx and saved as bitmap (BMP) or tagged image file (TIF) graphics. Insect graphics were used in the development of an interactive dichotomous key of the insect orders. Textual and graphical displays are provided for the orders. Homopteran and hymenopteran sonograms are included. Interactive questions provide evaluation of user input answer choice. A drag and drop interface quiz over insect orders and specimens provides feedback evaluation for choice.

IDENTIFICATION OF STRESS TOLERANT GENES IN GLYCINE MAX. *Hugh Fentress*, M. Ashari, E. Myles, B. Mallory, D. Long, and C. Caudle, 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 would also increase the efficiency of productivity in agricultural plants. The identification of genes involved in reducing water loss that can be transfected into plants that are sensitive to extended drought periods would be helpful. 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.

AVIAN EGG DATABASE DEVELOPMENT. *Jennifer Martin* and Larry Latson, Lipscomb University, Nashville, Tennessee.* Microsoft Access software was used to develop an avian egg database. Eggs of the David Lipscomb University Avian Egg Collection were documented and organized. The collection was donated to Lipscomb University in 1977 by the John A. Cordell family; its previous owner is unknown. The oldest date labeled

egg found in the collection was 1862. A thousand and twenty-five (1025) eggs were found in the collection and catalogued. The collection was found to contain the eggs of nineteen (19) orders, fifty-two (52) families and two hundred and twelve (212) species. The eggs of five endangered species and four threatened species were found in the collection. The database allows for organization and efficiency in selected comparisons.

ETHER SENSITIVITY IN FRUIT FLIES. *Melinda Sands* and Deborah Clark, Middle Tennessee State University, Murfreesboro, Tennessee.* The sensitivity of an organism to the chemicals in its environment may affect its ability to survive and reproduce. This preliminary experiment was designed to determine if sensitivity to ether in the fruit fly *Drosophilla melanogaster* is heritable. Thirty pairs of adults, and four of their offspring were exposed to ether and the time that it took them to "fall asleep" was recorded. Heritability was measured by dividing the observed correlation in sensitivity scores between parents and offspring, by the expected correlation of 0.5. Heritability for ether sensitivity was estimated to be 0.44, indicating that genetic factors may have contributed to the variation in sensitivity observed in this sample population.

INTERACTIVE ATLAS OF CANIS FAMILIARIS. *Sarah Quatman* and Larry Latson, Lipscomb University, Nashville, Tennessee.* A Windows based interactive atlas of *Canis familiaris*, the domestic dog, was developed using Asymetrix Corporation ToolBook authoring software. Gross anatomy photographs of a *Canis familiaris* specimen were made using a Minolta X370 camera and macrophotography equipment. Photographs were scanned using a Hewlett Packard ScanJet IICx and saved as Bitmap (BMP) or Tagged Image File (TIF) graphics; images were used in the development of an interactive anatomical atlas. The software-based atlas provides textual and graphical displays of selected external morphological features, superficial muscles and internal organs. Graphics allow magnification choice. Interactive questions provide evaluation of user input by answer choice.

THE USE OF MONOCLONAL ANTIBODIES TO SIMULTANEOUSLY DETECT NUCLEAR ENVELOPE AND MICROTUBULES IN CELLS: A COMPARISON OF PARA-FORMALDEHYDE-FIXED AND GLUTARALDEHYDE-FIXED CELLS. *Jacqueline E. Tate*, Amanda M. Morrison, Amber T. Marsh, and John R. Palisano, The University of the South, Sewanee, Tennessee.* This investigation developed and compared immunofluorescent techniques that allow the simultaneous visualization of nuclear envelope (NE) and microtubules (MT) in paraformaldehyde-fixed and glutaraldehyde-fixed cells. Traditional immunofluorescent studies of subcellular ultrastructures used paraformaldehyde to preserve cells. These studies demonstrated that a 3.7% HEPES buffered paraformaldehyde solution yielded well-preserved MT, but did not allow the preservation of NE. Buffered glutaraldehyde solutions are superior fixatives of subcellular ultrastructures, but antigenic epitopes are often masked. For this reason, glutaraldehyde has not been routinely used for immunofluorescent studies. A commercially available monoclonal antibody that recognizes lamin B, a NE specific protein, and a monoclonal antibody raised to α -tubulin, one of the protein components of MT, was used to detect NE and MT, respectively. NE in HeLa cells is best visualized when cells are fixed with 0.5% buffered paraformaldehyde solution; however, at this concentration MT disintegrate. An intermediate concentration, 2.0%

paraformaldehyde, allows for the simultaneous visualization of both NE and MT but neither structure is optimally preserved and the cell collapses. HeLa cells fixed in 0.5% HEPES buffered glutaraldehyde solution contain well-preserved MT and retain their three-dimensional cellular structure. However, the red autofluorescence of the glutaraldehyde fixative masks the red fluorescence of the lissamine rhodamine (LR) conjugated to the secondary antibody used to detect small NE fragments. To reduce the effect of the glutaraldehyde induced autofluorescence, a secondary antibody conjugated to CY-2, a fluorochrome that fluoresces green under ultraviolet light, was used to detect the NE. In HeLa cells fixed in 0.05% buffered glutaraldehyde solution, NE and MT are observed when the NE is labeled with CY-2 and the MT are detected by a secondary antibody conjugated to LR. With slight modifications, glutaraldehyde may be a better fixative agent in immunofluorescent investigations employing two different fluorochromes to detect NE and MT.

THE USE OF MONOCLONAL ANTIBODY RAISED TO LAMIN B TO VISUALIZE NUCLEAR ENVELOPE FRAGMENTS IN DIVIDING HELA CELLS. *Amanda M. Morrison**, *Jacqueline E. Tate*, and *John R. Palisano*, *The University of the South, Sewanee, Tennessee*. This investigation reports the first detection of nuclear envelope (NE) fragments in dividing HeLa cells using immunofluorescent techniques. While previous immunofluorescent investigations have demonstrated that 3.7% HEPES buffered paraformaldehyde solutions preserve cellular cytoarchitecture adequately, NE preservation in HeLa cells is poor. After several trials, a 0.5% buffered paraformaldehyde solution gave optimal NE preservation while minimizing nonspecific background fluorescence. The lack of fluorescent labeling localized in the cytoplasm of interphase cells supports the evidence that lamin B is only localized to the NE in interphase cells. The large membranous structures that are labeled by the fluorochrome during early prophase are large units of the NE that have not disassembled into the small vesicles during mitosis. In HeLa cells, the NE is more intensely stained by the fluorochrome during early prophase than in interphase. Furthermore, the NE frequently exhibits indentations during early prophase that are not present in interphase nuclei. We have documented that these cells are indeed in early stages of prophase by using DAPI to stain the chromosomes and by using indirect immunofluorescence to reveal the spindle poles on opposite sides of the nucleus. Frequently, the spindle poles are found in the NE indentations. The large fragments that are observed may be the confronting cisternae (CC) that Palisano and other investigators have reported observing in selected fetal and tumor cells undergoing mitosis. Comparative electron and immunofluorescent microscopy studies are needed to verify that the large NE fragments that are seen during immunofluorescent investigations are indeed CC.

EFFECT OF CHANGES IN MOBILE PHASE AND POTENTIAL ON ELECTROCHEMICAL REVERSED PHASE-HIGH PERFORMANCE LIQUID CHROMATOGRAPHY SENSITIVITY TO MELATONIN. *Micah T. Smith**, *Charles A. Griffy*, and *Joseph A. Sam*, *Bethel College, McKenzie, Tennessee*. The purpose of this study was to identify ways to increase sensitivity to melatonin in reverse phase (C-18) high performance liquid chromatography with electrochemical (EC) detection (BAS LC-4 detector). Using a mobile phase (MP1) described by Chin (1990), consisting of (14.4 mM citric acid, 10.0 mM sodium acetate, 4.0 mM sodium octylsulphonate, 1.0 mM disodium EDTA, and 0.25

mM dibutylamine phosphate, pH 3.25):acetonitrile:methanol (8:1:1, v/v/v), sensitivity to 10 ng melatonin (20 μ l injection loop) was increased from zero at 600 mV EC potential to a maximum sensitivity at 850 mV. Baseline disruption occurred at 900 mV. However, using a mobile phase (MP2) described by Lagana (1995), consisting of (50 mM sodium acetate, 100 mM acetic acid, and 0.1 mM disodium EDTA, pH 4.3):acetonitrile (3:1, v/v), baseline disruption did not occur at 900 mV. While MP2 only slightly increased melatonin sensitivity over MP1 at 750 mV, the sensitivity continued to increase at higher potentials (not possible with MP1) to a maximum at 950 mV requiring a reduction of sample mass to 100 pg. Using a mobile phase (MP3) similar to MP2 but consisting of 100 mM sodium acetate and 50 mM acetic acid, pH 4.9, there was a similar increase in sensitivity with increasing potential to a maximum at 950 mV. A comparison of melatonin sensitivity between MP2 and MP3 at 880-900 mV showed a significant increase in sensitivity with MP3. Sample mass of 10 pg was detectable at 950 mV in MP3.

SEQUENCE DETERMINATION OF AFRICANIZED HONEYBEE SPECIFIC PROTEINS USING ESI-MS. *Joshua D. Rogers** and *Ellen F. Verdel*, *Middle Tennessee State University, Murfreesboro, Tennessee*. Africanized honeybees (AHB) pose a serious threat to apiculture in the southern United States. Managed pollination of crops is of major importance to agriculture. European honeybees (EHB) are preferred over AHB as pollinators because, in addition to AHB aggressive behavior toward humans and farm animals, they may abandon their hives as frequently as 10 or 12 times a year. These characteristics make them difficult to manage and undesirable as pollinators for crops. It is possible to distinguish between them by several biochemical methods. The most reliable of these is based upon three proteins that are specific to AHB. These proteins have been partially characterized and the major piece of information lacking about these proteins is the amino acid sequence. Attempts at sequencing these proteins by automated Edmann degradation were unsuccessful due to N-terminal blockage. We are at present attempting to sequence these proteins using ESI-MS.

THE DINITROSALICYLATE ASSAY FOR REDUCING SUGARS. *Thurston E. Banks* and *Matthew A. Finn**, *Tennessee Technological University, Cookeville, Tennessee*. The dinitrosalicylate (DNS) assay is a simple and commonly used method of analysis for reducing sugars. Frequently, it is used to analyze for reducing sugars produced from enzymatic hydrolysis of substrates such as starch and sucrose. Amylase and invertase catalyzed reactions are typically buffered at pH 5 using acetate or citrate. A number of substances have been reported in the literature as interfering with DNS color development and citrate is one of these, however the reports are not consistent. This study indicates that acetate and citrate slightly enhance color development in the DNS assay and the true antagonist to this reaction is the proton, H⁺.

ESTIMATION OF HINDRANCE IN ORGANIC RADICALS BY A DIMENSION IN THE Z-AXIS. *Sabrina Bonner* and *Rudy Gostowski**, *Austin Peay State University, Clarksville, Tennessee*. Bimolecular reactions of organic radicals are diffusion-controlled unless steric factors are present. Steric factors shift the reaction rate from diffusion to activation control. The steric effect of twisted aryl groups has been quantified as a thickness of the molecule in the z-axis by means of MOPAC-RHF calculations

using the AM1 and PM3 data sets. The z-axis thickness parameter was determined by projecting the molecule on a plane that longitudinally bisects the p orbital containing the unpaired electron. The parameter correlates well with dimerization rate constants calculated by digital simulation of fast scan cycle voltammetry experiments.

SYNTHESIS OF FUNCTIONALIZED ALLYL HALIDES AND 2-METHYL-2-CYCLOHEXENONE INTERMEDIATES IN THE SYNTHESIS OF AB RING OF THE TAXANES. *Kimberly Herron**, and *Mohammad Karim*, Tennessee State University, Nashville Tennessee.

A KEY INTERMEDIATE IN THE SYNTHESIS OF PHENYLBICYCLO[2.2.2]OCTANE DERIVATIVES. *Matthew O. Barrett**, *Douglas B. Tatham*, and *Andrienne C. Friedli*, Middle Tennessee State University, Murfreesboro, Tennessee. In order to study the structure and photochemistry of self-assembled monolayer films from 1-trichlorosilyl-4-(4-octylphenyl) bicyclo[2.2.2]octane (1), we synthesized starting materials on large scale. 1-Phenylpropanone was obtained in 86% yield from commercially available benzyl cyanide. The overall ten-step procedure gave (1) in 5% yield. Initially, (1) and 1-trichlorosilyl-4-phenylbicyclo[2.2.2]octane (2) were synthesized via two analogous synthetic pathways. In principle, a key intermediate connects the two syntheses. Therefore, we investigated the conversion of 4-chlorophenylbicyclo[2.2.2]octane to phenylbicyclo[2.2.2]octane through reduction of the intermediate Grignard reagent. The approach could result in development of a single reaction pathway for a family of surface-active compounds.

STRUCTURE AND PROPERTIES OF 1,1-DIBROMO-2,2,3,3-TETRAMETHYLCYCLOPROPANE. *John A. Wasik** and *W. A. Tallon*, Lipscomb University, Nashville, Tennessee. The characteristics of 1,1-dibromo-2,2,3,3-tetramethylcyclopropane are reported. Synthesis was carried out using a Carbene-olefin reaction in the presence of sodium-tert-butoxide and pentane. Physical property measurements were carried out using the recrystallized product. Melting point was determined to be in the range of 75–76°C. Density measurements were carried out by forming the product (of known mass) into a cylinder and measuring the volume. Density values from previous experiments were compared with less than 2% difference in the values. Dipole moment measurements were made using an oscillating frequency counter to measure dielectric constant. Using the Debye-Lorentz-Lorenz equation, the dipole moment was calculated with preliminary results because of the low concentrations used in the solution. X-ray and spectroscopic data were compared with MacSpartan quantum mechanical program with only slight differences in bond angles and bond distances.

DETERMINATIONS OF TRITYLPOTASSIUM STABILITY BY PMR SPECTROSCOPY. *Brian Kyte**, *Mark Muiznieks**, *Angela Neal**, and *Fred J. Matthews*, Austin Peay State University, Clarksville, Tennessee. Tritylpotassium is a strong base that has been utilized in the formation of enolate anions for alkylation reactions. The base is formed from potassium hydride and triphenylmethane in the presence of a catalytic amount of DMSO under an inert atmosphere. Stability studies were conducted using PMR integration analysis of deuterated triphenylmethane formed by the slow addition of a 1 ml aliquot of tritylpotassium to deuterated water. Following extraction with ether,

washing with water, drying with sodium sulfate, and removal of the ether using a rotovap, PMR determination of the integrals of the aromatic versus methine protons was determined for the deuterated triphenylmethane. The ratio of aromatic to methine hydrogens for triphenylmethane is 15:1, while the ratio for deuterated triphenylmethane is 15:0. PMR data using a Bruker AC-250 FT-NMR and PCNMR provided data indicating the initial production of tritylpotassium as only 48% yield (15:0.5 ratio). Five additional aliquots taken over a 30-day period indicate the stability of tritylpotassium for 20 days (3 samples), after which a loss of 6% of base occurs in the next 10 days (2 samples) to a PMR integration ratio of 15:0.58 (42% tritylpotassium).

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CONTRIBUTIONS BY UNDERGRADUATE STUDENT RESEARCHERS TO THE ELUCIDATION OF CARCINOGEN-DNA STRUCTURES BY FLUORESCENCE SPECTROSCOPY. *G. A. Marsch*, *J. H. Farhat*, and *E. N. Goldman*, Union University, Jackson, Tennessee, Iowa State University, Ames, Iowa, and Lawrence Livermore National Laboratory, Livermore, California. Motivated undergraduate students were able to advance the goals of two ambitious research programs investigating the covalent interaction of carcinogenic molecules with DNA. In the first case, laser-excited fluorescence spectroscopy was used to probe the conformations of benzo[a]pyrene diol epoxide (BPDE) adducts to oligodeoxy-nucleotides containing mutagenic and non-mutagenic BPDE covalent binding sites. In the second case, fluorescence spectroscopy was used to examine the carcinogen-DNA structures of heterocyclic amine genotoxins found in foods. The students performed adduct syntheses, worked out High Performance Liquid Chromatography and polyacrylamide slab gel separations, manipulated high-vacuum and ultracold systems, operated high-intensity laser systems, and performed fluorescence spectroscopy on carcinogen-DNA samples. Importantly, they also learned environmental safety and health protocols and were thoroughly trained in general laboratory practices. The students enhanced our research program, and their efforts made the time and effort invested in their initial training worthwhile for them and for our project goals.

DOES NITRIC OXIDE PRODUCTION LOWER MEAN ARTERIAL BLOOD PRESSURE DURING PREGNANCY? *Swanette Anderson* and *Robert A. Ahokas*, Christian Brothers University, Memphis, Tennessee, and The University of Tennessee, Memphis, Memphis, Tennessee. Pregnancy is normally associated with vasodilation, and in hypertensive animals, such as the spontaneously hypertensive rat (SHR), causes a profound decrease in blood pressure. To test the possibility that enhanced basal vascular nitric oxide (NO) activity has a role in the vasodilation of pregnancy, we measured the changes in mean arterial blood pressure (MAP) induced by NG-nitro-L-arginine methyl ester, a specific inhibitor of NO synthesis, in conscious postganglionic blocked non-pregnant and pregnant SHR's. In the pregnant rats, litter size was adjusted to 1–12 on day 7 of pregnancy. On days 14 and 21 of pregnancy, MAP was measured before and 30 minutes after Hexamethonium (20 mg/kg, IV). MAP of the day 21,

but not 14 day pregnant rats was significantly lower than that of the non-pregnant rats. Hexamethonium decreased MAP 50–60 mmHg in all rats. NG-nitro-L-arginine methyl ester (10 mg/kg, iv). increased MAP greater in the non-pregnant than in the 21-day pregnant rats. These results suggest that vascular NO activity is not increased in pregnancy, and is not responsible for the decrease in MAP. Rather, vasodilation is due to a late pregnant decrease in sympathetic neurogenic vascular tone, which is modulated by some unknown mechanism by the fetoplacental unit.

DEXAMETHASONE INHIBITION OF INDUCIBLE NITRIC OXIDE SYNTHASE PRODUCTION IN MACROPHAGES STIMULATED WITH GENITAL MYCOPLASMAS. *Karima T. Causey, Dennis T. Crouse, B. Keith English, Cindy Newman, Elizabeth Meals, and Lisa Livingston, Christian Brothers University, Memphis, Tennessee (KTC), The University of Tennessee, Memphis, Memphis, Tennessee, and LeBonheur Children's Medical Center, Memphis, Tennessee.* (DTC, BKE, CN, EM, LL). In preterm infants, mycoplasmas are associated with the chronic lung disease, Bronchopulmonary Dysplasia. Dexamethasone is a corticosteroid often administered to these infants to suppress inflammation. Nitric oxide (NO) formation, in macrophages and increased intrinsically in humans during inflammation, is controlled by an enzyme called inducible nitric oxide synthase (iNOS). Thus, studying iNOS production could be used as a marker for inflammation that occurs due to the stimulation of macrophages by mycoplasmas and the effect of dexamethasone on this process. We hypothesized that dexamethasone would decrease iNOS production in mycoplasma-stimulated macrophages. Macrophage cell cultures were incubated with sterile media alone, Lipopolysaccharide (LPS) (1 or 100 ng), *Mycoplasma hominis* (Mh) (104, 105, and 106 colony forming units (cfu)/ml, or *Ureaplasma urealyticum* (Uu) (104, 105, 106 cfu/ml) for 16 h. Immunoelectrophoresis was used to measure iNOS. Incubation of the macrophages with 1 or 10U Interferon Gamma and either LPS, Uu, or Mh produced iNOS in a dose-dependent manner. Dexamethasone reduced the production of iNOS in all experiments. Thus, genital mycoplasmas stimulate iNOS in a dose-dependent fashion, which can be inhibited by dexamethasone.

NITRIC OXIDE SYNTHASE ACTIVITY IN THE RED BLOOD CELL: IS IT POSSIBLE? *Kevin Ford and Ellen S. Kang, Christian Brothers University, Memphis, Tennessee (KF) and The University of Tennessee, Memphis, Memphis, Tennessee (ESK).* Nitric oxide (NO) is a powerful mediator of physiological processes in the vascular system. It is tightly regulated by rapid inactivation to NO₂ upon interaction with reducing substances such as the iron in hemoglobin and cysteine and tyrosine as amino acids or peptide residues. Each of these mechanisms for inactivation is present in red blood cells (RBC). We studied whether the RBC had nitric oxide synthase (NOS) activity by a direct assay, unlike two reports of NOS activity in RBC by increase in NO₂ which could result from nitrosothiol groups released from peptide residues. Normal human RBCs recovered after washing with Tris buffer (pH 7.2) were sonicated at 4°C, centrifuged (15,000g for 30 min), aliquoted, and stored at -70°C until analysis. NOS activity was measured with mM NADPH by recovery of ³H L-citrulline from ³H L-arginine as substrate. Time and protein (Lowry) were varied with incubation at 37°C, detected by beta counting of ³H L-citrulline. NOS activity was detected in the supernatant fraction but not in the pellet fraction. Optimum conditions for NOS were 50 µg protein using 0.5 mM ³H L-

arginine incubated for 5 min at 37°C. These findings with a more direct assay support the earlier reports that RBC's express NOS activity in the cytoplasmic fraction and not the membrane. We speculate this capability gives the RBC a vital role in the regulation of processes controlled by NO.

CARNITINE LEVELS IN RAT RED BLOOD CELLS, WHITE BLOOD CELLS, AND BLOOD SERUM. *N. Koenigsnecht, M. Volk, and M. Banschbach, Christian Brothers University, Memphis, Tennessee (NK), and Oklahoma State University College of Osteopathic Medicine, Tulsa, Oklahoma (MV, MB).* Carnitine is an essential carrier molecule of fatty acids that plays a key role in the human body by serving as an accessory for burning fat. When carnitine levels are low, the body exclusively depends on glucose as the energy source. Severe carnitine deficiency can result in muscular dysfunction with serious clinical implications. The purpose of this study was to determine if carnitine could be measured in either red blood cells or white blood cells using a new coupled enzyme spectrophotometric assay that we developed. Serum and washed red or white blood cell fractions were prepared from red blood. The spectrophotometric assay using alpha-ketoglutarate dehydrogenase, carnitine acetyl transferase, and diaphorase was used to determine free carnitine (in untreated samples) and total carnitine (in base hydrolyzed samples). While carnitine was easily detected in serum, no carnitine was detected in red or white blood cell extracts. If future experiments to improve extraction of carnitine from red and white blood cells yield satisfactory results, one of the more costly but more sensitive carnitine assays will need to be used to assay these samples.

MECHANISM OF POTASSIUM CHLORIDE-INDUCED RELEASE OF ARACHIDONIC ACID AND CONTRACTION OF BLOOD VESSELS: SELECTIVE ACTIVATION OF LIPOXYGENASE AND INHIBITION OF PROSTAGLANDIN SYNTHESIS. *Zachary Maxwell, Mubarak M. Muthalif, Jason Harper, Nour Karzoun, and Kafait U. Malik, Christian Brothers University, Memphis, Tennessee and The University of Tennessee, Memphis, Memphis, Tennessee.* This study was conducted to elucidate the mechanism by which potassium chloride (KCl), which causes depolarization and increases extracellular calcium (Ca²⁺) influx, promotes arachidonic acid release for prostaglandin synthesis and their contribution to vascular smooth muscle contraction. In cultured rabbit vascular smooth muscle cells (VSMC), KCl (60 mM) increased the activity of Ca²⁺/calmodulin dependent protein activity, cytosolic phospholipase A₂ activity, and arachidonic acid release. However, KCl failed to increase prostaglandin synthesis in VSMC or intact aortic rings. In both VSMC and aortic rings, exogenous arachidonic acid was converted to prostaglandins, but their production was inhibited during exposure to KCl. Interestingly, in the presence of the lipoxygenase inhibitor, baicalein, KCl increased prostaglandin production in both VSMC and aortic rings. KCl-induced contraction of aortic rings was reduced by the prostaglandin endoperoxide receptor antagonist, ifetroban. These data suggest that KCl promotes arachidonic acid release by increasing cytosolic phospholipase A₂ activity via activation of Ca²⁺/calmodulin dependent protein kinase II and mitogen activated protein kinase. Moreover, the arachidonic acid released by KCl is converted by lipoxygenase, and the products of lipoxygenase inhibit production of prostaglandins and cause accumulation of prostaglandin endoperoxides, which contribute to KCl induced contraction of rabbit aorta.

IMMUNOASSAYS OF GLYCOPHORIN A: AN ERYTHROCYTE MEMBRANE PROTEIN. *L. Gregory Meriwether, Dennis Carrigan, and Douglas P. Blackall, Christian Brothers University, Memphis, Tennessee (LGM), and The University of Tennessee, Memphis, Memphis, Tennessee (DC, DPB).* Glycophorin A is an erythrocyte integral membrane protein that carries the human MN blood group antigens. This protein serves as a receptor for several pathogens, including reovirus and *Plasmodium falciparum*, the causative agent of malaria. Recombinant glycophorin A was expressed in a variety of eukaryotic cell lines through transfection techniques. Chinese hamster ovary (CHO) cells were mainly utilized for this purpose, and stable CHO cell lines were established expressing either the M or the N allele of glycophorin A. Eight glycophorin A-specific monoclonal antibodies were assessed for their ability to bind with either red blood cell or recombinant glycophorin A immunoblotting, immunofluorescence, and immunomagnetic bead agglutination. These monoclonal antibodies included three specific for the M allele of glycophorin A (6A7, M2A1, AO9), four specific for the N allele of glycophorin A (N61, NN3, N92, AH7), and one NM nondiscriminatory antibody (10F7). Immunoblotting revealed that six of the eight antibodies were capable of binding normal red blood cell glycophorin A, while only two antibodies bound recombinant glycophorin A. Similarly, by immunofluorescence, only three antibodies recognized recombinant glycophorin A in stable CHO cells expressing recombinant glycophorin A, while the other five failed. These results suggest a fundamental difference between red blood cell and recombinant glycophorin A. Future studies will be directed to expressing a recombinant glycophorin A molecule more similar to the red blood cell membrane version.

THE ROLE OF SERUM EOSINOPHILIC CATIONIC PROTEIN IN EXERCISE-INDUCED ASTHMA. *B. Myers, K. V. Leeper, J. Soberman, T. T. Mastin, and P. Jordan, Christian Brothers University, Memphis, Tennessee, and The University of Tennessee, Memphis, Memphis, Tennessee.* Asthma is a disease characterized by chronic inflammation. One of the many key cells involved in the inflammatory process in the lung is the eosinophil. Eosinophils and their mediators, specifically eosinophilic cationic protein (ECP), are potential markers of the severity of the inflammatory response. The aim of this work was to ascertain whether patients with exercise-induced asthma (EIA) demonstrate not only an immediate increase in ECP, but also one that is sustained up to 30 min after exercise is ceased. We studied five asthma patients and seven healthy nonasthmatics (controls) which were age, race, and sex matched. Three different blood samples were obtained from each subject, one prior to exercise (baseline), the next immediately after exercising at 50% predicted VO_2 max for five min, and a third after exercise was stopped and the participant had rested for 30 min. A total of 36 samples were analyzed using a Radioimmunoassay kit. Comparison of the EIA group and the non-EIA group was done with the Kruskal-Wallis test. In comparison with studies by Venge et al., their results showed elevated ECP levels in asthmatics. Therefore, it might be possible to determine the severity of a disease based on ECP levels.

UP-REGULATION OF CADHERINS FOLLOWING CENTRAL NERVOUS SYSTEM INJURY IN RATS. *Felix Vazquez-Chona and Eldon E. Geisert Jr., Christian Brothers University, Memphis Tennessee (FVC), and The University of Tennessee,*

Memphis, Tennessee (EEG). Following a lesion of the CNS, astrocytes become reactive and in many cases form a scar. Defining the molecular mechanisms governing glial scar formation is critical to understanding how the CNS responds to injury. In the present study, the role of cadherin at the glial scar was studied using immunohistochemistry and western blotting. The expression of cadherin in astrocytes was confirmed in cultures of rat astrocytes where it was expressed at regions of cell-cell contact. Cadherin was consistently upregulated at the site of gliosis following a stab wound in the CNS of the adult rat. A quantitative analysis from injured and non-injured cortex revealed a threefold increase of a cadherin, a 135 kDa band in the injured tissue. The location of this band is consistent with the electrophoretic mobility of N-cadherin. Due to its crucial role in the intercellular adhesion of most cell types, the high levels of cadherin at the site of CNS injury indicate that cadherin may play a role in the response of astrocytes to injury and in the formation and maintenance of the glial scar.

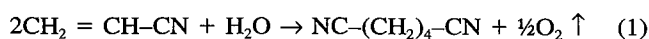
CROSS-SECTIONAL GEOMETRY OF THE RAT FEMUR. *Kate M. O'Leary, Aparna K. Murti, Carolyn R. Jaslow, and Alan P. Jaslow, Rhodes College, Memphis, Tennessee.* The physical dimensions of a skeleton are designed to respond to many forces, including forces that occur during locomotion. The second moment of area (I_{xx}) of limb bones is critical for resisting bending force during locomotion. Our goal was to test the hypothesis that I_{xx} would be greatest at the midshaft of a limb bone, where maximal bending forces are expected to occur. Femurs of nine rats were sectioned at five locations from proximal to distal. At each location a slide was made of the bone cross-section. Images of the sections were scanned into a computer, and I_{xx} was determined. I_{xx} was significantly different among the bone locations, however, it was significantly lower at the midshaft than at the proximal end of the bone. These results suggest that I_{xx} is not necessarily greatest at the region of maximal bending forces during locomotion, reflecting other functional demands on the bone.

THE DISLOCATED KNEE. *Trent A. Gullett, Fred Azar, Scott Sharp, and Marc Mihalko, Christian Brothers University, Memphis, Tennessee (TAG), Campbell's Clinic, Memphis, Tennessee (FA, SS), and The University of Tennessee, Memphis, Memphis, Tennessee (MM).* Dislocation of the knee is a traumatic injury that involves ligament damage. In this retrospective study, the charts of 38 knee dislocation patients over the last twelve years were reviewed. The purpose of this research was to determine if one form of treatment (surgery and/or physical therapy) was more beneficial to the healing of the knee than another type of treatment (physical therapy without surgery). Background, associated injuries, and treatment were recorded for each patient. This research revealed two interesting aspects. The first was the comparison between associated injuries (arterial and/or nerve damage) and the velocity of the knee dislocation (high velocity or low velocity). There was a higher incidence of associated injuries with low velocity dislocations as compared to high velocity injuries. Also, research revealed that the range of motion of a patient's knees that received surgery was less than the range of those who did not receive surgery. This study revealed that low velocity knee dislocations can be very traumatic, and that a follow-up of at least two years is needed for determining the health and the progress of a re-cooperating dislocated knee.

AUTOMATION OF RESEARCH APPARATUS USING LABVIEW TECHNOLOGY. *Greg Dunlap, Kevin McKinny, and M. Shah Jahan, The University of Memphis, Memphis, Tennessee.* In our laboratory, research apparatus such as electron spin resonance (ESR) spectrophotometer, thermoluminescence (TL) detector, and optical multi channel analyzer are controlled, in some fashion, by computers, and data are collected and analyzed by the available software programs. Although the conventional methods have produced many good results with regard to measurements of free radicals and defects in polymeric orthopedic devices, occasional errors are found, and inconsistency between measurements and between results obtained from different techniques is not an uncommon event. In order to minimize such problems and to perform parallel controlling of various experimental parameters from one site, we have developed an experimental automation scheme using LabView technology (hardware and software). At present, we are in the process of controlling magnetic field of the ESR spectrophotometer, collecting data (ESR signal) as a function of the scanning field, and performing signal averaging to obtain smooth spectra. Our goal is to control time at a given temperature and magnetic field. Furthermore, we propose to use LabView for simultaneous runs of the TL and optical emission experiments.

INFLUENCE OF THE NORTH HOLLYWOOD DUMP ON WOLF RIVER SEDIMENT METALS CONCENTRATIONS. *T. Briggs, C. J. Leppanen, and K. J. Maier, Christian Brothers University, Memphis, Tennessee (TB), and the University of Memphis, Memphis Tennessee (CJL, KLM).* The North Hollywood Dump in Memphis, Tennessee is a closed municipal/industrial landfill and federally listed superfund site. We examined core Wolf River sediments for metal concentrations upstream, adjacent to, and downstream of the dump to determine the influence of the dump on Wolf River sediment toxicity. Metal concentrations were determined using graphite furnace atomic absorption for Pb, and flame atomic absorption for Al, Ba, Cu, Fe, Mn, and Zn. Aluminum, iron, and zinc concentrations were highest adjacent to the dump. Copper and lead concentrations peaked at the downstream site. Manganese concentrations were greatest upstream and Barium was not present in any sediment. More frequent sampling, as well as taking a greater number of samples will aid in pinpointing the source(s) of contamination.

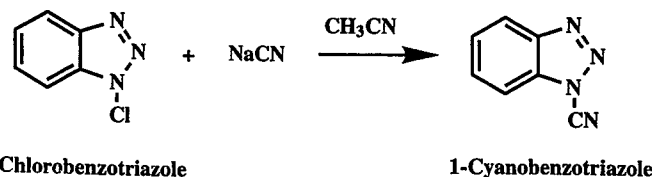
SELECTIVITY CONTROL IN THE ELECTROREDUCTION OF ACTIVATED OLEFINS. *Amani Johnson-Singh, Charles Oliver Sudlow, and Daniel A. Lowy, The University of Memphis, Memphis, Tennessee.* Two competing processes occur in the electroreduction of acrylonitrile (AN): a reductive dimerization to adiponitrile (AD) via the Baizer reaction, Eq. (1) and a non-dimerizing electroreduction, which yields propionitrile (PN), Eq. (2). Surprisingly, this latter process, has been almost ignored, regardless of its possible industrial applications.



The experimental setup consists of an electrochemical cell equipped with a lead cathode and a PbO₂ anode. An aqueous Na₂SO₄ solution (1M, pH 7) was used as the supporting electrolyte. In order to obtain AD a quaternary ammonium salt (QAS) was added to the electrolyte. The organic phase obtained during AN electroreduction was analyzed by GC-MS. The selectivity of

AN electroreduction is essentially controlled by the presence of the QAS in the supporting electrolyte. In the absence of QAS, PN forms with a yield of 82.8%, whereas in the presence of QAS, dimerization to AD occurs with a yield of 96.7%. Future work is aimed to control the selectivity of electroreductions for a series of activated olefins: acrylamide, ethyl acrylate, and allyl glycidyl ether. The mechanism of the competing electroreductions will be addressed.

AN INEXPENSIVE AND SAFE SYNTHESIS OF 1-CYANOBENZOTRIAZOLE AND THE EXPLORATION OF ITS USE AS A CN⁺ ELECTROPHILE. *S. D. Hammond, M. P. Cava, and T. Hughes, The University of Alabama, Tuscaloosa, Alabama.* Little study of 1-cyanobenzotriazole as a cyanation reagent has been reported because of the difficulty and expense of synthesizing the reagent. A relatively safe and inexpensive procedure for the production of 1-cyanobenzotriazole will be described. Initial studies indicate that 1-cyanobenzotriazole can be used to successfully perform carbon cyanation reactions. This new synthetic technique will further the study of 1-cyanobenzotriazole as a source of CN⁺.



ASPECTS OF HYDROGEN BONDING IN HIGHLY SUBSTITUTED PYRROLES. *Hilary C. Williams and Charles M. Baldwin, Union University, Jackson, Tennessee.* The definition of the hydrogen-bond has remained narrow to the present, including only interactions involving hydrogen bound to strongly electronegative elements such as oxygen, nitrogen, or fluorine. A new molecule has been synthesized, ethyl-1,2-dimethyl-4,5-diphenylpyrrole-3-carboxylate, in which evidence for the existence of a hydrogen bond has accrued. The intermolecular hydrogen bond between the methylene hydrogen of the 2-methyl group and the carbonyl-oxygen of the 3-carboxyethyl group has been substantiated by NMR and X-ray crystallography. This paper will address the synthesis of model compounds designed to systematically weaken the "hydrogen-bond" interaction by incrementally increasing the distance between the 2-methyl group and the carboxyethyl group at C3 position of the pyrrole ring.

INTRAMOLECULAR HYDROGEN BONDING IN 2-HALOMETHYL DERIVATIVES OF ETHYL 1,2-DIMETHYL-4,5-DIPHENYLPYRROLE-3-CARBOXYLATE. *A. J. Flynn and C. M. Baldwin, Union University, Jackson, Tennessee.* The existence of an intramolecular hydrogen bond in ethyl 1,2-dimethyl-4,5-diphenylpyrrole-3-carboxylate has been established by X-ray crystallography and variable temperature NMR data. The bonding interaction between the methyl hydrogen atoms at the C2 position of the pyrrole ring and the carbonyl oxygen at the C3 position of the pyrrole ring has been further studied in halogenated analogues of the parent compound. Attention will be focused on the chloro-derivative(s) of the parent compound.

LOW ANTIOXIDANT POTENTIAL AND PSYCHOLOGICAL DISTRESS AMONG THE MORBIDLY OBESE. *Michael E. Cole, Cynthia K. Buffington, Richie J. Feuers, Ronald W. Hart,*

and George S. M. Cowan, Christian Brothers University, Memphis, Tennessee (MEC), The University of Tennessee, Memphis, Memphis, Tennessee (CKB, GSMC), and The National Center for Toxicological Research, Jefferson, Arkansas (RJF, RWH). Free radicals such as peroxides cause irreversible damage to membranes, DNA, mitochondria, and other cellular components. Glutathione plays an important role in the destruction of organic peroxides and other free radicals through a reaction catalyzed by Glutathione peroxidase (GPx). In our studies, we measured the activities of GPx and enzymes important in the reduction of glutathione, glucose-6-phosphate dehydrogenase (G6PDH) and glutathione reductase (GR), in isolated red blood cells of morbidly obese (MO) and lean patients (LC). We found that neither G6PDH nor GR activities (using student *t*-tests) significantly differed ($P > 0.05$) between the MO and LC groups, suggesting normal levels of NADPH and reduced glutathione in our MO population. GPx activities of the MO, however, were significantly ($P < 0.001$) below LC values. As GPx is important in catalyzing the removal of hydrogen peroxide, low activities of this enzyme would thus reduce antioxidant potential. We conclude that the ability to detoxify free radicals within our morbidly obese population is impaired, producing a potential for the accumulation of oxidative damage. This may contribute to the development of degenerative diseases often associated with obesity such as arthritis, diabetes, and arteriosclerosis.

THYROID HORMONE REGULATION OF UCP-2 AND THE OB GENE IN RAT ADIPOSE TISSUE. Linda Nguyen and Su-leiman Bahouth, Christian Brothers University, Memphis, Tennessee and The University of Tennessee, Memphis, Memphis, Tennessee. UCP-2 is an uncoupling protein that recently has been discovered in white adipose as well as in extra adipose tissue. UCP-2 belongs to the family of uncoupling proteins which function to burn excess fat and to generate heat from ATP. Another gene product produced in white adipocytes is the ob gene product leptin which serves as a satiety signal. Therefore, we sought to determine if UCP-2 and leptin expression could be regulated by thyroid hormone since thyroid hormone controls much of the body's metabolic functions. Twenty-five μg samples of RNA were obtained from epididymal adipose tissue of euthyroid, hypothyroid, and hyperthyroid rats. These samples, along with markers and blanks, were then subjected to electrophoresis, transferred onto nylon membranes, and probed by Northern blotting with ^{32}P -labeled probes for UCP-2 and leptin. The blots were counted to determine the influence of altered thyroid status on UCP-2 and leptin mRNA levels. The Packard InstainmagerTM revealed that the radioactive count in UCP-2 from hyperthyroid rats was 7,386 cpm, the euthyroid count was 4,325, and the hypothyroid count was 4,003 cpm. On the other hand, the cpm in leptin mRNA were highest in hypothyroid RNA and lowest in hyperthyroid conditions. These radioactive counts were representative of the levels of UCP-2 and leptin mRNAs seen in altered thyroid states. Consequently, the hyperthyroid condition resulted in much more UCP-2 than either of the other two conditions tested while the reverse was true for leptin. Therefore, in hyperthyroidism there is a decrease in satiety signaling (increased food consumption) and an increase in fat utilization for heat production.

LOCALIZATION OF D₂ DOPAMINE RECEPTORS IN AVIAN STRIATUM USING IMMUNOHISTOCHEMICAL LABELING. Rodney A. Paullus, Christian Brothers University, Mem-

phis, Tennessee. The purpose of this research was to provide evidence as to the neuronal location of the D₂ subfamily of dopamine receptors in avian (specifically pigeon) striatal projection neurons in comparison with their mammalian counterparts (specifically rat). The basal ganglia regulate motor output via dopamine connections from the substantia nigra to the striatum. Neurodegeneration of part of the basal ganglia occurs in Parkinson's and Huntington's Disease and impairs the ability of the basal ganglia to originate movement within the striatum. An Avidin Biotin Complex method of immunohistochemical labeling with antigen retrieval in a sodium citrate buffer was used to localize the D₂ receptors. Examination of the immunohistochemical labeling showed that the LPO and PA striatal regions possessed the greatest amount of labeling for D₂ receptors. The labeling appeared characteristic in labeling of cholinergic neurons. These results are consistent with previous localization studies for D₁ receptors in avian striatum using the phosphoprotein DARPP-32 in showing that the striatum is enriched in D₁ and D₂ dopamine receptors. This study also suggests a possible antigenic difference between rat D₂ and pigeon D₂ receptors.

PHOTORECEPTOR DAMAGE IN CULTURED ADULT RABBIT RETINAL EXPLANTS. M. Svadlenka, D. A. Johnson, M. E. C. Fitzgerald, M. M. Jablonski, S. Ashraf, and T. O. Woods, The University of Tennessee, Memphis, Memphis, Tennessee. The purpose was development of an explant culture system for utilization in establishing an in vitro model of photoreceptor damage. To this end, sections of cornea were co-cultured with retinal explants and/or retinal pigmented epithelial cells (RPE). Morphology of processed tissue was assessed by light microscopy. Explant cultures, in the absence of RPE, also were subjected to complement-mediated lysis of photoreceptors with B6-30N anti-opsin. Retinas were examined both light microscopically coupled with double labeling using indirect immunolabeling with WGA (wheat germ agglutinin)/PNA (peanut lectin agglutinin) followed by examination on the confocal microscope. WGA stains rods green and PNA dyes cones red by binding to glycoproteins on the cell membranes. The tissue co-cultures using cornea as a substrate did not remain in contact with each other. The intrinsic qualities of the RPE were demonstrated as it repeatedly formed a tight ball of cells away from the cornea substrate. In retinas exposed to anti-opsin/complement, the structure of the photoreceptor outer and inner segment complex was altered. Outer segments were completely absent and the inner segments appeared to seep from the outer nuclear layer. The lectin-binding pattern also was modified and some photoreceptor cell loss was noted. The cornea was determined a poor substrate for RPE and retinal explant cultures. A model of photoreceptor damage was successfully generated in a full thickness adult retinal explant. This model will serve as a template in which potential photoreceptor rescue factors can be tested.

DIFFERENTIAL DIAGNOSIS FOR PATIENTS WITH PRE-SYNCOPE SYMPTOMS. F. A. Hayes and H. Rashed, Christian Brothers University, Memphis, Tennessee and The University of Tennessee, Memphis, Memphis, Tennessee. Syncope or fainting is a common clinical disorder whose main etiology is deficient cerebral blood flow resulting from peripheral circulatory failure. Using tilt table testing, a non-invasive method, subjects with histories of frequent fainting and dizziness were studied. Two other groups also were studied; those with pre-syncope and age-matched control groups were compared. Because syncope is

mainly a peripheral autonomic dysfunction, monitoring brachial blood pressure alone during tilt table testing was often insufficient in diagnosing syncope. Ankle blood pressure, when expressed as the ankle/brachial ratio has been shown helpful in the assessment of the peripheral circulatory dysfunction during tilt table testing. When this ratio was used to investigate patients during tilt table testing, significant differences were found in the ankle/brachial ratios of control subjects, syncope patients, and pre-syncope patients. Systolic blood pressure ratios of patients with syncope and control patients were compared; they differed in both supine and tilted positions. When the controls were compared to the pre-syncope patients a significant difference was found in the systolic ratio only in the tilted position. The observed results suggest that using ankle blood pressure, in a ratio with brachial blood pressure, to monitor the autonomically-controlled peripheral cardiovascular responses to posture is a valuable method to diagnose, evaluate and predict peripheral autonomic dysfunction in patients with syncope and pre-syncope.

RELATIONSHIP OF ACOUSTICAL PROPERTIES OF THE VOICE AND HEALTH STATUS IN OLDER ADULTS. Y. Q. Lin, Veronica F. Engle, Barbara Fuller, Marshall J. Graney, and Douglas Connor, Christian Brothers University, Memphis Tennessee (YQL), The University of Tennessee, Memphis, Memphis, Tennessee (VFE, MJG), and The University of Colorado, Denver, Colorado (DC). The purpose of this study was to identify the relationship between acoustical properties of the voice and health status (HS) of older adults. Acoustical properties of the voice (jitter, shimmer, and tenseness), are non-invasive, physiological measures of stress that are influenced by HS, but have not been studied in older adults. Older adult volunteers from the community ($n = 28$, 50% men) with a mean $\pm SD$ age of 73.46 ± 6.6 years and average education of 13.6 ± 3.4 years were recruited from a Senior Citizen Center. HS and demographic data were collected using a questionnaire. Participants produced three sets of four phonations of the vowels 'a' and 'e'. A uniform five second segment of each vowel phonation was digitized and processed using computerized speech laboratory (CSL) and Horii computer programs. The mean of 12 samples for each subject

was calculated and used for statistical analysis. In the vowel 'a', jitter, shimmer, and tenseness were significantly correlated with male gender, while only jitter and shimmer were significantly correlated with age; and no significant correlations were observed between HS and the voice acoustics. For the vowel 'e' only shimmer was significantly correlated with male gender, and only jitter was significantly correlated with smoking and surgery. The results indicate a differential effect of HS and demographic characteristics of the participant on acoustical properties of the voice for vowels 'a' and 'e' which should be considered when conducting future research.

THE EFFECTS OF MANUAL LYMPHATIC STIMULATION IN WOMEN SUFFERING FROM SECONDARY LYMPHEDEMA. Lyndsay Woodward, Cathy Sanford, Laurel Means, Kris Valentine, and Tammy Gibson, Christian Brothers University, Memphis, Tennessee (LW) and Huntsville Hospital East, Huntsville, Alabama (CS, LM, KV, TG). Secondary lymphedema is a disease that occurs due to some kind of external conditions, usually a result of surgery that occurred in surrounding areas to lymphatic tissue. Patients suffering from breast cancer are at high risk for lymphedema. These studies were conducted on a cohort of twenty female patients, suffering from secondary lymphedema subsequent to breast cancer surgery. Manual lymph drainage (MLD) is the main technique used for the treatment of this disease. The treatment consisted of outpatients undergoing a series of exercises and massages, in order to release some of the excess fluid and proteins from the affected extremity. Measurements are taken on both the affected and unaffected extremities at 5 cm increments. Therapy was received three times a week during the first 4-6 weeks. Once positive results are seen, follow-up therapy is performed at 1, 3, 6, and 12 months. The 20 patients were subdivided into 3 groups: 0-23 months, 24-59 months and 60-120 months, based on the onset of lymphedema. Based on our results the percent edema was reduced the most (89%) in patients who obtained treatment within two years of the onset or in individuals that had been afflicted with the disease for at least six years (79%) prior to the initiation of therapy. The least of improvement (34%) was obtained from the group in which therapy was initiated 3-5 years from the onset of the disease.