Apo-E’s role in lipid transport was originally thought to be the only role it played, however new research suggest that Apo-E is linked to a variety of other mechanisms as well. To further study the alternative roles in which Apo-E plays, 3T3-L1 cells were used as a model, to study how Apo-E affects inflammation. 3T3-L1 cells were inflamed using TNF-alph and the levels of inflammation were observed measuring pro-inflammatory adipokines; Leptin, Resistin and Adiponectin. Apo-E was introduced and the levels of the pro-inflammatory markers fell in response, indicating that Apo-E plays some role in some anti-inflammatory responses.

This experiment studied the contribution of different calcium channels to smooth muscle contractions of bovine left anterior descending (LAD) arteries. We examined whether L-type or T-type channels were more responsible for contractile activity using nifedipine and mibefradil as L-type and T-type calcium channel inhibitors, respectively. Arterial rings were hung on force transducers in Krebs solution. The arteries were treated with either the drug or the drug’s vehicle, then contracted with U46619 to observe the effect on overall contraction. The results were gathered using Chart and standardized by determining the force per cross sectional area of each arterial ring. Nifedipine reduced force by 1.654 g/mm², or 41%, relative to the control values. Treatment with mibefradil resulted in a 24% reduction in stimulated force relative to control (0.771 g/mm²). Combining the two inhibitors diminished stimulated force by 25%, a reduction of 0.702g/mm² relative to the control value. These data suggest that that L-type calcium channels play a larger role in smooth muscle contraction in LAD arteries of bovine hearts than T-type channels.
9:20
TESTING FOR GENETIC VARIABILITY AMONG POPULATIONS OF ROCKHOPPER PENGUINS
Jeanette Feider, Carolyn Marcelo, and Kristen Richards (Dr. Waltke Paulding)

Recent genetic analyses have suggested that rockhopper penguins can be further divided into two species, northern rockhopper (Eudyptes moseleyi) and southern rockhopper (Eudyptes chriysocome) (Jouventin 2006). Rockhopper penguins are natives of South America with populations in Chile, Argentina, and the Falkland Islands. Twenty feather samples were collected in 2007 from Isla Terhalten, Chile, and genomic DNA was extracted from each of the samples. Three microsatellite loci were cross-amplified using primers developed from the Huimboldt penguin (spheniscus humboldtii) via the polyenerase chain reaction (PCR). PCR products will be sequenced in order to analyze samples for genetic variability. This study is important because both the northern and southern rockhopperspecies have been placed on the International Union for the Conservation of Nature and Natural Resources (IUCN) Red List, with the southern rockhopper as a vulnerable species and the northern rockhopper as an endangered species (IUCN 2008). Due to a small sample size and that the samples were collected in an isolated area, the samples will exhibit low genetic variability.

9:40
DECIPHERING THE DIFFERENT VOCAL CHARACTERISTICS BETWEEN MALE AND FEMALE CAPTIVE FLORIDA MANATEES
Rebecca A. Santho, Jacob B. Wasserman (Dr. Charles Grossman and Dr. Jennifer Robbins)

It is not known whether Florida manatees (Trichechus manatus latirostris) have a characteristic “vocal signature” that would identify them as an individual in the wild. Studies have been done regarding the vocalizations of manatees as a whole, but differences between individual manatee vocalizations have been neglected. The goal of this study was to differentiate individual manatees based on the characteristics of their vocalizations thus, assign a vocal signature to each individual manatee. First, we determined that differences in vocalizations could be detected between male and female captive adult Florida manatees by analyzing the following vocal characteristics; duration, number of harmonics, fundamental frequency, step size, and modulation. A total of 302 previously recorded vocalizations were studied from male manatees at the Cincinnati Zoo and female manatees at the Columbus Zoo. Preliminary results indicate there is a significant difference between male and female vocalizations with regard to duration, fundamental frequency, step size, and modulation pattern. In addition, this study looked to see if we could discern any information from these vocal characteristic variables that might couple to the size of the manatee due to a possible correlation between body weight and fundamental frequency.
Diabetes is a devastating disease that affects millions of people worldwide. In the United States 23.6 million people, or 8% of the population have some form of diabetes, which had an economic impact of $174 billion dollars in 2007 (American Diabetes Association). Investigating ways to treat and ultimately cure the disease is imperative to many lives. People with Type 1 diabetes are unable to regulate blood glucose levels because of autoimmune destruction of their insulin producing beta cells. The ultimate goal of type 1 diabetes research is to determine how to replace the lost or damaged beta-cells. Transplantation based approaches using cadaveric islets have been used successfully, but there is a scarcity of donated tissues. Replacing lost or damaged beta-cells by regenerating new beta-cells in the body, or by replacing lost tissue with beta-cells derived from other sources such as embryonic stem cells would have a significant impact on the lives of millions of people with diabetes. There has recently been some success differentiating human embryonic stem cells into insulin producing cells using information from studies of embryonic pancreas development, thus highlighting that understanding how the pancreas develops is critical. This study focused on the transcription factor, Sox17, which is known to be a key regulator of embryonic development in other contexts. We have shown that Sox17 is present in the developing pancreas, yet the specific role for Sox17 is presently unknown. In order to investigate a role for Sox17 during pancreas development, we utilized a mouse genetic approach that allows us to spatially and temporally overexpress Sox17. From our findings we
conclude that: 1) Sox17 expression maintained between E9.5-E16.5 promotes duct-like cells at the expense of endocrine cells. 2) Sox17 expression maintained between E12.5-8 weeks arrests a subset of cells in an NGN3-positive endocrine progenitor state. This result is of specific interest. To this point, identifying a progenitor cell in the adult pancreas has remained elusive, but has implications for regenerative medicine and diabetes research. Taken together, our results demonstrate that Sox17 has different temporally regulated roles during development.

11:00

THE EFFECTS OF L-TYPE AND T-TYPE CALCIUM CHANNEL INHIBITORS ON SMOOTH MUSCLE CONTRACTION OF LEFT ANTERIOR DESCENDING ARTERY OF BOVINE HEARTS

Laura Borchers, Christine Chuck, Jordan Clendenen, K. Payton Keller, Meredith McAdams, Nina Mecca, Michelle Poineau, and Evan Werk (Dr. Lisa Close-Jacob)

This experiment studied the contribution of different calcium channels to smooth muscle contractions of bovine left anterior descending (LAD) arteries. We examined whether L-type or T-type channels were more responsible for contractile activity using nifedipine and mibefradil as L-type and T-type calcium channel inhibitors, respectively. Arterial rings were hung on force transducers in Krebs solution. The arteries were treated with either the drug or the drug’s vehicle, then contracted with U46619 to observe the effect on overall contraction. The results were gathered using Chart and standardized by determining the force per cross sectional area of each arterial ring. Nifedipine reduced force by 1.654 g/mm², or 41%, relative to the control values. Treatment with mibefradil resulted in a 24% reduction in stimulated force relative to control (0.771 g/mm²). Combining the two inhibitors diminished stimulated force by 25%, a reduction of 0.702g/mm² relative to the control value. These data suggest that that L-type calcium channels play a larger role in smooth muscle contraction in LAD arteries of bovine hearts than T-type channels.

11:20

NUMERICAL DISCRIMINATION AND FORAGING BEHAVIOR IN NORTHERN MOCKINGBIRDS.

John P. Chadwell, Christina Baldwin, Warren Leas (Dr. George L. Farnsworth)

When birds are faced with foraging options, optimal foraging theory predicts that they will chose the option that provides the largest reward with the least effort. We tested the ability of a wild Northern Mockingbird (Mimus polyglottos) to optimally choose between two feeders that varied in difficulty of operation and amount of reward provided. In our first trial, the bird was presented with the choice between a feeder with 1 cup and 1 stick, and a feeder with 3 cups and 1 stick. In our second trial, the choice was between a feeder with 1 cup and 1 stick, and another feeder with 1 cup and 6 sticks. In our third trial, one feeder had 1 cup and 1 stick, while the other had 3 cups and 6 sticks. In trials 1 and 2, the bird chose feeders in the manner predicted by optimal foraging theory, preferentially going for more food and fewer sticks, respectively. In the third trial, the bird showed an equal preference for both feeders, with the bird’s preference for more food seemingly acting against its avoidance of more obstacles. These results indicate that the Northern Mockingbird tested exhibited numerical discrimination in regards to both reward and effort.
The common ancestor of modern humans and their closest relatives, chimpanzees, experienced a phylogenetic split some seven million years ago. Over this time, the evolutionary pathway that led to Homo sapiens has experienced multiple changes that have forever distinguished them morphologically from Pan troglodytes. The most recognizable of these phenotypic characteristics is the development of superior intellectual capacity, as evidenced by the growing complexity in the neural systems giving rise to phenomena such as language and consciousness. This can be attributed to a general trend toward the increase in cranial capacity in the genus Homo. The growth in the volume of the skull was most likely accompanied by a variety of parallel morphological changes in cranial anatomy. The purpose of this study was to quantify aspects of craniofacial morphology that reflect these changes. A series of craniofacial measurements were made on several representative species in the Hominid lineage with the aim of ascertaining key transformations in skull morphology that may have been linked to the evolution of larger brain size. Apart from the expected increase in cranial width, there were no significant correlations found among these measurements.
LONGITUDINAL STUDY INVESTIGATING POSSIBLE CIRCAANNUAL SWIMMING BEHAVIORS OF CAPTIVE FLORIDA MANATEES (TRICHECHUS MANATUS LATIROSTRIS) IN THE MANATEE SPRINGS EXHIBIT AT THE CINCINNATI ZOO

Sara Roper, Allie Tewell (Dr. Charles J. Grossman)

Many animals exhibit circadian or circannual rhythms in their behaviors. To date, it has not been determined if Trichechus manatus latirostris, the Florida manatee, also demonstrates such rhythms in behaviors. This study compared monthly swimming behaviors of five manatees housed in Manatee Springs at the Cincinnati Zoo. Longitudinal data to monitor the movements of manatees in the tank was collected using a grid scheme set-up. A cloth grid was attached to the glass viewing window of the tank and the grid was used to record the blocks traversed by the manatees during a 1-minute run. Data collected over the past nine years was compiled to compare the blocks traversed by each manatee each month. This data was further compared using the Kruskal-Wallis Rank test. Analysis found significant differences in three of the five manatees, in the way their month-to-month swimming behaviors changed. This suggests a possible rhythm to the swimming behaviors of Florida manatees over the course of the year. Further study must expand on the data values and determine if the manatees have increased swimming movements in one season of the year versus another.

THE EFFECTS OF AQUAPRO HERBICIDE ON NITROGEN FIXATION ACTIVITY IN AZOLLA-ANABAENA

Robert Jen, Karan Motiani (Dr. Linda Finke)

Many developing countries use Azolla-Anabaena, an N2-fixing system, as a fertilizer for aquatic crops. The complex is a symbiotic relationship between the cyanobacterium Anabaena and the water fern Azolla. One potential problem, however, is the application of herbicides. Herbicides are known to suppress the growth of unwanted plants, but its impact on this N2-fixing system is unknown. Consequently, this study investigated the effects of a herbicide called AquaPro on Azolla-Anabaena by examining whether there was a significant decline in nitrogen-fixing activity and, subsequently, a decline in the growth of the complex. To detect any changes in N2-fixing activity, the study involved an acetylene reduction assay of Azolla-Anabaena following treatment with Aquapro for one week. Growth was determined by qualitatively measuring the change in surface area coverage by the Azolla plant. Results showed a 98% decrease in N2-fixing activity and no growth since there was a negative change in surface area.

MAZE LEARNING IN THE COMMON WALL LIZARD, PODARCIS MURALIS
The purpose of the experiment was to observe the behavior and maze learning ability of the Common Wall lizard, *Podarcis muralis*. In order to test its learning ability, the lizard was introduced to a maze that was surrounded on the floor and walls with ice, and the reward for completion of the maze was a heat lamp. One lizard was used for the experiment, a span of four weeks, due to the death of other lizards. The time to complete the maze and number of errors made by the lizard were recorded. A simple and a complex maze were used to assess learning ability. In the simple maze 66.7% of the trials had no errors. In the complex maze there was a decrease in completion of the maze with an increase in errors made from 100% with no errors to 14% with two errors. Based on the data collected the lizard made no significant improvement in time, number of errors, or completion of the complex maze and was deemed to have not fully learned that maze.

3:40
INCREASING TITERS OF INSULATED VECTORS BY RESTORING RT/INT FUNCTION
Kyle B. Mitts (Dr. Engle)

The purpose of this experiment was to improve titers of an insulated lentivirus vector, specifically the super β-globin vector. Gene therapy technology has been limited by the risks of using available vectors to introduce modified genes into humans. The lentivirus vectors are potentially useful because their integration causes less complication than those of the previously used retro-onco viral vectors. The cHS4 insulated element was integrated within the sβG vector, and thereby lower titers of the vector were observed. Alteration of the secondary structure of the Reverse Transcriptase (RT) gene is thought to be part of the cause for the lower titers. RT was ligated into the insulated vector, along with RT/Integrase fusion, in the hopes of restoring the titers to levels that would be considered therapeutic when used in gene therapy treatments. Some titer restoration occurred with RT supplemented insulated vector, and however an even larger increase in titer was observed when a RT/INT fusion was placed in the insulated vector. Increased levels were still lower than the sβG uninsulated titer results.
4:30  Introduction

4:40

ENHANCEMENT OF THE SURVIVAL OF ESCHERICHIA COLI IN THE PRESENCE OF THE NITROGEN FIXING AZOLLA-ANABAENAM SYMBIOSIS
Grace E. Hallenbeck, Caitlin A. Richter (Dr. Linda Finke)

The aquatic fern Azolla is used as a biofertilizer because its symbiotic partner Anabaena-azollae fixes atmospheric nitrogen to ammonia, a plant nutrient. Recent public health scares have illustrated the ability of the pathogenic bacterium E. coli O157:H7 to survive in association with leafy vegetables. Is it possible that the nitrogen-fixing activity of the Azolla-Anabaena system, widely grown in rice fields, may support extended survival of fixed nitrogen-dependent pathogens like E. coli? To examine this possibility, Azolla was grown in mineral nutrient media both with and without fixed nitrogen. The activity of nitrogenase, the enzyme responsible for nitrogen fixation, was quantitated by way of the acetylene reduction assay. E. coli was inoculated into systems of both types, as well as into appropriate control solutions. Recovery of surviving E. coli with EMB agar 5 days post-inoculation revealed that the presence of Azolla held no survival advantage to the E. coli.

5:00

A QUANTITATIVE COMPARISON OF LIMB BONE MORPHOLOGY OF SELECTED NEW WORLD AND OLD WORLD MONKEYS
Chad M. Solik (William Anyonge)

Maximum articular lengths of principal limb bones of selected Old World (family Cercopithecidae) and New World (family Cebidae) monkeys were measured. Brachial and crural indices were computed from these measurements and subjected to an analysis of variance. Results indicated that New World monkeys in general displayed smaller brachial indices than Old World monkeys. New world monkeys tended to have elongated proximal elements in their forelimbs, which suggested a possible adaptation for arboreal locomotion. The crural indices showed a more random assortment of values with no clear trends among any of the two groups of monkeys. This study highlights the complex relationship between evolution, environmental pressures, and locomotor behavior. Monkeys are often classified as either terrestrial or arboreal (Old World or New World) even though it is apparent that there is a tremendous variation in locomotor behaviour and habitat preference among species found within each family.

5:20

MAZE LEARNING IN THE COMMON WALL LIZARD, PODARCIS MURALIS
Ann Cherukara, Dominique Griffin, Kyle Yeager (Dr. George Farnsworth)

The purpose of the experiment was to observe the behavior and maze learning ability of the Common Wall lizard, Podarcis muralis. In order to test its learning ability, the lizard was introduced to a maze that was surrounded on the floor and walls with ice, and the reward for completion of the maze was a heat lamp. One lizard was used for the experiment, a span of four weeks, due to the death of other lizards. The time to complete the maze and number of errors made by the lizard were recorded. A simple and a complex maze were used to assess learning ability. In the simple maze 66.7% of the trials had no errors. In the complex maze there was a decrease in completion of the maze with an increase in errors made from 100% with no errors to 14% with two errors. Based on the data collected the lizard made no significant improvement in time, number of errors, or completion of the complex maze and was deemed to have not fully learned that maze.
Recent genetic analyses have suggested that rockhopper penguins can be further divided into two species, northern rockhopper (*Eudyptes moseleyi*) and southern rockhopper (*Eudyptes chriysocome*) (Jouventin 2006). Rockhopper penguins are natives of South America with populations in Chile, Argentina, and the Falkland Islands. Twenty feather samples were collected in 2007 from Isla Terhalten, Chile, and genomic DNA was extracted from each of the samples. Three microsatellite loci were cross-amplified using primers developed from the Hulmboldt penguin (*spheniscus humboldti*) via the polyenerase chain reaction (PCR). PCR products will be sequenced in order to analyze samples for genetic variability. This study is important because both the northern and southern rockhopper species have been placed on the International Union for the Conservation of Nature and Natural Resources (IUCN) Red List, with the southern rockhopper as a vulnerable species and the northern rockhopper as an endangered species (IUCN 2008). Due to a small sample size and that the samples were collected in an isolated area, the samples will exhibit low genetic variability.
Section 05 lab

Moderator: Mr. Nourian

8:00 Introduction

8:10 TESTING THE ACCURACY OF THE M-RATIO IN DETERMINING POPULATION BOTTLENECK IN A CINCINNATI POPULATION OF PODARCIS MURALIS USING MICROSATELLITE LOCI

Tracie Duling, Brandyn Hester, Halley Lazarony, Catherine Marcelo (Dr. Waltke Paulding)

A small population of Podarcis muralis lizards were brought to the greater Cincinnati area from Milan, Italy in the 1950’s. The lizards have adapted to the area and continue to successfully propagate. The Lizard population is known to have experienced a bottleneck. Therefore by using this population as a control, several mathematical equations can be analysed, to see if the equations can predetermine if a given population has experienced a bottleneck. This experiment is intended to use the genetic variability found in the local wall lizard population to determine the validity of such a test. After extracting DNA from the tails of the experimental organisms, three different microsatellite loci were analysed for levels of heterozygosity and observed using capillary electrophoresis. The results of the capillary electrophoresis will be entered into the test, and the results should validate the equations being tested for the presence of a bottleneck population.

8:30 SEX RATIOS IN NORTHERN MOCKINGBIRD BROODS IN OHIO AND NORTH CAROLINA.

Amsul Khanal (Dr. Farnsworth and Dr. Engle)

To determine the sex ratios in nests of Northern Mockingbirds (Mimus polyglottos) in Ohio and in North Carolina, feathers were collected from nestlings to sample DNA. Males are homogametic (having two Z chromosomes), and females are heterogametic (having one Z and one W chromosome). PCR was used to amplify a region on the sex chromosome that is different on the Z and the W chromosome. Gel electrophoresis was used to determine the sex of each nestling. An overall male-biased sex ratio in the Ohio population was found (75 males and 52 females; $\chi^2_1 = 4.165, p = 0.041$). In contrast, a female-biased sex ratio was found in the North Carolina population (24 females and 5 males; $\chi^2_1 = 12.4, p < 0.001$). The male chicks may represent a greater parental investment due to their greater size. In the higher-density population in North Carolina, it may be adaptive to overproduce female chicks because females are more likely to disperse.

8:50 THE RELATIONSHIP BETWEEN JAW AND SKULL MORPHOLOGY AND FEEDING TYPE IN UNGULATES

Kristen Klatte (Dr. William Anyonge)

Ungulates are hooved mammals such as horses, cows, and pigs whose diet consists primarily of vegetation with varying degrees of toughness. The purpose of this study was to explore the relationship between jaw and skull morphology and feeding type in ungulates. A total of 18 jaw and cranial traits that have been shown to reflect the functional significance of jaw musculature were measured from the skull of 16 species of representative ungulates from each order (Perissodactyla and Artiodactyla). Each species was classified as a grazer or a browser based on dietary preferences. It was hypothesized that grazers, when compared to browsing ungulates within each order, would exhibit jaw and cranial characteristics that reflected adaptations to a tougher diet. The results of this study show there is no significant difference between browsing and grazing ungulate masticatory musculature.
THE EFFECT OF PUBLIC VIEWING ON MIDWEST FLORIDA MANATEE SWIMMING BEHAVIOR
James L. Barlow, Rebecca J. Bruning, Katherine M. Haap, Jason L. Kelty, Matthew D. Niehaus, Avante D. Roberts (Charles J. Grossman)

This project focuses on the two captive male Florida manatees located at the Cincinnati Zoo & Botanical Gardens. The Florida manatee, (Trichechus manatus latirostris) is concentrated in the area of the Florida coastline, residing in both marine and freshwater habitats. The manatee is a very social mammal, often aggregating in groups. The main focus of the study was to observe the swimming behavior of the captive manatees when visitors were present in the viewing area. The viewing glass of the manatee tank was divided up into blocks creating a tape grid system. The swimming behavior of the manatees was then tracked and recorded by observing the number of blocks traversed. It was predicted that the manatees’ swimming behavior would increase significantly when visitors were present in the viewing area of Manatee Springs. Initial observations have shown increased swimming behavior when public viewers were present and statistical analysis is currently being performed to confirm the data is significant.
Section 06 lab
Moderator: Dr. Matre

10:30 Introduction

10:40 MAZE LEARNING IN THE COMMON WALL LIZARD, PODARCIS MURALIS
Ann Cherukara, Dominique Griffin, Kyle Yeager (Dr. George Farnsworth)

The purpose of the experiment was to observe the behavior and maze learning ability of the Common Wall lizard, *Podarcis muralis*. In order to test its learning ability, the lizard was introduced to a maze that was surrounded on the floor and walls with ice, and the reward for completion of the maze was a heat lamp. One lizard was used for the experiment, a span of four weeks, due to the death of other lizards. The time to complete the maze and number of errors made by the lizard were recorded. A simple and a complex maze were used to assess learning ability. In the simple maze 66.7% of the trials had no errors. In the complex maze there was a decrease in completion of the maze with an increase in errors made from 100% with no errors to 14% with two errors. Based on the data collected the lizard made no significant improvement in time, number of errors, or completion of the complex maze and was deemed to have not fully learned that maze.

11:00 THE EFFECT OF INVASIVE AMUR HONEYSUCKLE ON NATIVE LEAF LITTER DECOMPOSITION
Gabrielle J. Borak (Dr. Brent Blair)

Amur honeysuckle, *Lonicera Maackii*, is a common invasive shrub native to Eastern Asia. Invasive species are known to outcompete native species for resources and faster decomposition rates of invasives may favor these high productivity species over slower growing native plants due to increased nutrient availability. This study sought to analyse the decomposition rates of Amur honeysuckle and native species to determine the effects of Amur Honeysuckle’s presence on forest leaf litter decomposition. Decomposition of native leaf litter was examined in the presence and absence of Amur honeysuckle. This study posited a positive correlation between the presence of Lonciera maackii and an increased rate of decomposition in native species. The results of this study did indicate that leaf litter decomposition of honeysuckle is faster than that of native species. The data also suggests that decomposition rates increased for native leaf litter present in plots containing Amur honeysuckle as compared to the forest plots where the decomposition rates remained relatively stable. The results obtained were congruent with the hypothesis of the research.

11:20 DECIPHERING THE DIFFERENT VOCAL CHARACTERISTICS BETWEEN MALE AND FEMALE CAPTIVE FLORIDA MANATEES
Rebecca A. Santho, Jacob B. Wasserman (Dr. Charles Grossman and Dr. Jennifer Robbins)

It is not known whether Florida manatees (*Trichechus manatus latirostris*) have a characteristic “vocal signature” that would identify them as an individual in the wild. Studies have been done regarding the vocalizations of manatees as a whole, but differences between individual manatee vocalizations have been neglected. The goal of this study was to differentiate individual manatees based on the characteristics of their vocalizations thus, assign a vocal signature to each individual manatee. First, we determined that differences in vocalizations could be detected between male and female captive adult Florida manatees by analyzing the following vocal characteristics: duration, number of harmonics, fundamental frequency, step size, and modulation. A total of 302 previously recorded vocalizations were studied from male manatees at the Cincinnati Zoo and female manatees at the Columbus Zoo. Preliminary results indicate there is a significant difference between male and female vocalizations with regard to duration, fundamental
frequency, step size, and modulation pattern. In addition, this study looked to see if we could discern any information from these vocal characteristic variables that might couple to the size of the manatee due to a possible correlation between body weight and fundamental frequency.

11:40
ENDOGENOUS CARDIOTONIC STEROIDS MEDIATE RENAL VASCULAR RESISTANCE POST SALINE VOLUME EXPANSION

Danielle M. Reilly, Valerie M. Lasko, Michelle L. Nieman (John N. Lorenz)

Cardiotonic steroids (CTS) like digoxin and ouabain inhibit the Na,K-ATPase and enhance smooth muscle contractility. This occurs through a well-defined mechanism whereby binding of CTS to the Na,K-ATPase α1-subunit decreases Na⁺ extrusion, leading to Ca²⁺ accumulation within the myocyte. Recent evidence suggests that endogenous CTS participate in regulating cardiovascular and renal function. We sought to examine CTS/α1-subunit interactions in the regulation of renal hemodynamics. Two different mouse models were examined: wild type, which have a ouabain-resistant α1-subunit, and mutant mice with a ouabain-sensitive α1-subunit. Mice were pre-treated with Digibind, a CTS-antibody, or vehicle and infused with saline for 30-minutes. Results were similar for both genotypes: no differences were seen during infusion, but during the 30-minute recovery period, pre-treatment with digibind blunted the increase in renal vascular resistance seen in vehicle-treated mice. We conclude that endogenous CTS act to constrict the renal vasculature in response to a saline load.
Session Seven: Tuesday, April 28, 2009  12:30 p.m.

Section 07 lab

Moderator:  Dr. Matre

12:30   Introduction

12:40
A PILOT STUDY OF PROLIFERATION AND NEBS USING A DTA MOUSE MODEL
Jessica E. Kopp (Dr. Dorothy Engle)

Chronic obstructive pulmonary disease (COPD) is a major cause of death and illness. COPD is a lung disease in which the bronchioles are partly obstructed. Many airway disorders like COPD are characterized by cycles of bronchial epithelial injury and incomplete repair. The precise cellular processes in remodeling are unknown, but recently neuroepithelial bodies (NEB’s) have been assigned a potential pulmonary stem cell niche. NEB’s are clusters of neuroendocrine cells located in the bronchioles. We used a conditional mouse model system and looked for the niche of progenitor cells during repair. Upon doxycycline treatment for two days bronchiolar cells die and regenerate thereafter. Our central hypothesis is that the bronchiolar around NEB’s are the progenitor cells repopulating the epithelium. The purpose of this research was to test whether proliferation is increased around NEB’s. To test this hypothesis we performed immunohistochemistry for CGRP, which is a marker for NEB’s, and KI67, which is a marker for dividing cells. We assessed the proliferation index of cells in the NEB’s. The results show that more analysis is needed to determine if NEB’s are the niche of progenitor cells.

1:00
THE EFFECTS OF L-TYPE AND T-TYPE CALCIUM CHANNEL INHIBITORS ON SMOOTH MUSCLE CONTRACTION OF LEFT ANTERIOR DESCENDING ARTERY OF BOVINE HEARTS
Laura Borchers, Christine Chuck, Jordan Clendenen, K. Payton Keller, Meredith McAdams, Nina Mecca, Michelle Poineau, and Evan Werk (Dr. Lisa Close-Jacob)

This experiment studied the contribution of different calcium channels to smooth muscle contractions of bovine left anterior descending (LAD) arteries. We examined whether L-type or T-type channels were more responsible for contractile activity using nifedipine and mibebradil as L-type and T-type calcium channel inhibitors, respectively. Arterial rings were hung on force transducers in Krebs solution. The arteries were treated with either the drug or the drug’s vehicle, then contracted with U46619 to observe the effect on overall contraction. The results were gathered using Chart and standardized by determining the force per cross sectional area of each arterial ring. Nifedipine reduced force by 1.654 g/mm², or 41%, relative to the control values. Treatment with mibebradil resulted in a 24% reduction in stimulated force relative to control (0.771 g/mm²). Combining the two inhibitors diminished stimulated force by 25%, a reduction of
0.702g/mm² relative to the control value. These data suggest that L-type larger role in smooth muscle arteries of bovine hearts than T-type channels.

1:20
LIMB BONE MORPHOLOGY IN FAST RUNNNING UNGULATES
Gregory Morgan (Dr. William Anyonge)

Ungulates, hoofed mammals, have evolved morphological adaptations for cursorial locomotion (ability to achieve and maintain high speeds for an extended period of time). Skeletal adaptations specially designed for rapid locomotion over terrestrial environments include: elongation of distal limb elements, reduction of distal mass, and fusion or reduction of bones. Ungulate skeletons consistently display distal limb elements that are significantly elongated relative to proximal limb elements. There is also pronounced fusion and reduction of bones in the distal limbs, for example the reduction of the ulna which fuses to the radius. The purpose of this study is to quantify these adaptations in limb morphology in selected species of odd-toed and even-toed ungulates. Since fast locomotion is an important factor in predator avoidance, a comparison of limb morphology among ungulates could provide valuable insights into how natural selection has favored the evolution of similar traits in prey species from various ecological settings.

2:20
TESTING THE ACCURACY OF THE M-RATIO IN DETERMINING POPULATION BOTTLENECK IN A CINCINNATI POPULATION OF PODARCIS MURALIS USING MICROSATELLITE LOCI
Tracie Duling, Brandyn Hester, Halley Lazarony, Catherine Marcelo (Dr. Waltke Paulding)

A small population of Podarcis muralis lizards were brought to the greater Cincinnati area from Milan, Italy in the 1950’s. The lizards have adapted to the area and continue to successfully propagate. The Lizard population is known to have experienced a bottleneck. Therefore by using this population as a control, several mathematical equations can be analysed, to see if the equations can predetermine if a given population has experienced a bottleneck. This experiment is intended to use the genetic variability found in the local wall lizard population to determine the validity of such a test. After extracting DNA from the tails of the experimental organisms, three different microsatellite loci were analysed for levels of heterozygosity and observed using capillary electrophoresis. The results of the capillary electrophoresis will be entered into the test, and the results should validate the equations being tested for the presence of a bottleneck population.

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Department of Biology
Senior Research Symposium
April 27, 28, 29, 30, 2009
Albers Hall - 307
Session Eight: Tuesday, April 28, 2009  2:30 p.m.

Section 08 lab

Moderator:  Dr. Farnsworth

2:30 Introduction

THE EFFECTS OF L-TYPE AND T-TYPE CALCIUM CHANNEL INHIBITORS ON SMOOTH MUSCLE CONTRACTION OF LEFT ANTERIOR DESCENDING ARTERY OF BOVINE HEARTS
Laura Borchers, Christine Chuck, Jordan Clendenen, K. Payton Keller, Meredith McAdams, Nina Mecca, Michelle Poineau, and Evan Werk (Dr. Lisa Close-Jacob)

This experiment studied the contribution of different calcium channels to smooth muscle contractions of bovine left anterior descending (LAD) arteries. We examined whether L-type or T-type channels were more responsible for contractile activity using nifedipine and mibefradil as L-type and T-type calcium channel inhibitors, respectively. Arterial rings were hung on force transducers in Krebs solution. The arteries were treated with either the drug or the drug’s vehicle, then contracted with U46619 to observe the effect on overall contraction. The results were gathered using Chart and standardized by determining the force per cross sectional area of each arterial ring. Nifedipine reduced force by 1.654 g/mm², or 41%, relative to the control values. Treatment with mibefradil resulted in a 24% reduction in stimulated force relative to control (0.771 g/mm²). Combining the two inhibitors diminished stimulated force by 25%, a reduction of 0.702g/mm² relative to the control value. These data suggest that L-type calcium channels play a larger role in smooth muscle contraction in LAD arteries of bovine hearts than T-type channels.

3:00

ANALYSIS OF LIMB BONE ALLOMETRY IN SMALL CATS
Kasey E. Lachner (Dr. William Anyonge)

This study examines allometric scaling relationships between limb bone lengths and body mass in small cats (Family Felidae) that inhabit various habitats in the New and Old World. Crural and brachial indices were computed from measurements on principal limb bones in six species of wild cats to determine if a correlation exists between evolutionary increase in body mass and limb bone length. It was hypothesized that differences in hind limb and forelimb scaling patterns in species from both the Old and New World would indicate specializations in use of the forelimb for subduing prey, or adaptations in locomotor patterns that may reflect habitat preferences. The results indicated that the ocelot (Old World) had a much lower crural index than did the wildcat, sandcat, and lynx (New World). Also, the bobcat (New World) displayed a lower mean crural index than the wildcat and sandcat. There were no significant differences in the brachial index among any of the small cats. There was no consistent pattern in the differences in forelimb to hindlimb ratio between the Old and New World small cats. The lack of any significant differences in the brachial index among any of the small cats. There was no consistent pattern in the differences in forelimb to hindlimb ratio between the Old and New World small cats. The lack of any significant differences in the brachial index between New and Old World species of small cats suggests that small felids tend to have similar forelimb proportions.

3:20

TESTING FOR GENETIC VARIABILITY AMONG POPULATIONS OF ROCKHOPPER PENGUINS
Jeanette Feider, Carolyn Marcelo, and Kristen Richards  (Dr. Waltke Paulding)

Recent genetic analyses have suggested that rockhopper penguins can be further divided into two species, northern rockhopper (Eudyptes moseleyi) and southern rockhopper (Eudyptes chrysoCOME) (Jouventin 2006). Rockhopper penguins are natives of South America with populations in Chile, Argentina, and the Falkland Islands. Twenty feather samples were collected in 2007 from Isla Terhalten, Chile, and genomic DNA was extracted from each of the samples. Three microsatellite loci were cross-amplified using primers developed from the Hulmboldt penguin (spheniscus humboldti) via the polymerase chain reaction (PCR). PCR products will be sequenced in order to analyze samples for genetic variability. This study is important because both the northern and southern rockhopperspecies have been placed on the International Union for
the Conservation of Nature and Natural Resources (IUCN) Red List, with the southern rockhopper as a vulnerable species and the northern rockhopper as an endangered species (IUCN 2008). Due to a small sample size and that the samples were collected in an isolated area, the samples will exhibit low genetic variability.

3:40
EFFECTS OF AN SV2 KNOCKOUT ON SYNAPTIC ACTIVITY; PRESYNAPTIC FLUORESCENT PROTEIN SYNTHESIS YIELDING INFORMATION ABOUT CELLULAR FUSION

Matthew C. O'Reilly (Dr. David Richards)

SV2 Knock-Out Study
This study attempted to determine the cellular complications that may result from the loss of synaptic vesicle protein 2 (SV2). The knock-out of SV2 is expected to have a greater impact on the readily-releasable pool of vesicles while leaving the reserve pool largely unchanged. SV2 was planned to be made useless while using silencing RNA. Then the release of neurotransmitter could be observed through the fluorescence of the cell by FM1-43 dye, which would yield information implicating different pools as the source of the vesicles. Data was collected for the normal cellular response, without silencing SV2, which showed increased fluorescence with increased exposure to excitatory artificial cerebral spinal fluid. However, results were not obtained for an SV2 knock-out because it was not created during the research.

Fluorescent Presynaptic Fusion Protein Study
The study attempted to determine the workings between the presynaptic proteins by fusing them to differently colored fluorescent proteins. The results would indicate points of contact between differing proteins and could elicit information regarding their relationships. Thus, the DNA behind the structure of each protein was added to plasmids coding for the colors cherry, cyan, green, and banana(yellow). Actin was tagged with cyan color while synaptobrelin and synaptophysin were tagged green. However, the proteins of individual cells were never tagged at the same time. This could have allowed for the simultaneous viewing of distinct proteins within the same cell, which may have led to further evidence regarding the differing theories of vesicle fusion.
Session Nine: Wednesday, April 29, 2009 8:30 a.m.

Section 01 lab

Moderator: Mr. Nourian

8:30
3D-GUIDED COMPUTED TOMOGRAPHY ANALYSIS OF SKULL THICKNESS IN A MOUSE MODEL OF MUCOPOLYSACCHARIDOSIS TYPE I

Erin N. Ballard (Dr. Engle)

This study was done to quantitatively distinguish between physical features of MPS I and unaffected mice by developing a more accurate method for studies involving bone disease measurements. This was conducted using a three-dimensional approach, an improvement on the two-dimensional radiographs used previously. Specifically, the thickness of the skulls were analyzed and measured to test for differences using microCT scans and Amira software. Using Amira a rotatable cross-section was oriented using a 3D construction as reference. The skull thickness was measured at three specific points. Results showed significance (p<0.05) in the differences between MPS I and unaffected mice skull thickness in two out of the three measurements taken. The third measurement, located at the sagittal suture did not prove to be significant (p=0.064), perhaps because it was on the suture. This study opens the opportunity for future evaluation of animal models using microCT scans and Amira on bone disease therapies.

8:50
CORRELATION BETWEEN DENTAL MORPHOLOGY AND FEEDING BEHAVIOR IN UNGULATES

Lisa M. Vogl (Dr. William Anyonge)

Ungulates are hoofed mammals that are classified in two Orders; Perissodactyla (odd-toed ungulates such as horses, tapirs, and rhinos), and Artiodactyla (even-toed ungulates such as cows, deer, and antelopes). This study investigates whether dental characteristics such as tooth area on the occlusal (grinding) surface, and crown height can be used to distinguish between browsing and grazing ungulates. Due to dietary adaptations among the two groups, teeth are worn down in distinct patterns that allow the quantification of observable and measurable differences. It was hypothesized that grazers will exhibit pronounced hypsodonty (higher tooth crown height), and more complex ridge patterns on the occlusal surface than browsers and thus provide a basis for assessing the relationship between dental morphology and feeding ecology.

9:10
NUMERICAL DISCRIMINATION AND FORAGING BEHAVIOR IN NORTHERN MOCKINGBIRDS.

John P. Chadwell, Christina Baldwin, Warren Leas (Dr. George L. Farnsworth)

When birds are faced with foraging options, optimal foraging theory predicts that they will chose the option that provides the largest reward with the least effort. We tested the ability of a wild Northern Mockingbird (Mimus polyglottos) to optimally choose between two feeders that varied in difficulty of operation and
amount of reward provided. In our first trial, the bird was presented with the choice between a feeder with 1 cup and 1 stick, and a feeder with 3 cups and 1 stick. In our second trial, the choice was between a feeder with 1 cup and 1 stick, and a feeder with 1 cup and 6 sticks. In our third trial, one feeder had 1 cup and 1 stick, while the other had 3 cups and 6 sticks. In trials 1 and 2, the bird chose feeders in the manner predicted by optimal foraging theory, preferentially going for more food and fewer sticks, respectively. In the third trial, the bird showed an equal preference for both feeders, with the bird’s preference for more food seemingly acting against its avoidance of more obstacles. These results indicate that the Northern Mockingbird tested exhibited numerical discrimination in regards to both reward and effort.

9:20
THE INVASION OF AMUR HONEYSUCKLE, *Lonicera Mackii*, AND ITS EFFECTS ON THE SOIL DYNAMICS OF SOUTHWESTERN OHIO’S FORESTS
*Abby Strietmann, Andrew Uhling, Sameer Rasa (Dr. Brent Blair)*

This study attempted to determine the impact of the invasive species Amur Honeysuckle, *Lonicera Mackii*, on native soil dynamics in Mt. airy Forest, specifically the nitrogen mineralization rate. Amur Honeysuckle is expected to increase the nitrogen mineralization rate, and thus, the amount of plant available inorganic nitrate (NO₃) in the soil which plants use for photosynthetic and growth processes. To determine the effects of Amur Honeysuckle on soil dynamics, Mt. Airy forest was chosen as the location of study. Soil samples from invaded and un-invaded plots were collected and spectrophotometry was used to determine the nitrogen mineralization rates from the native and invaded soils. Soil pH readings were also conducted. The results of this study indicate that nitrate levels increased and soil pH decreased in invaded soils. The mineralization rate was slightly higher in soils invaded by Amur Honeysuckle but the result was not statistically significant.
10:30
THE EFFECTS OF AQUAPRO HERBICIDE ON NITROGEN FIXATION ACTIVITY IN AZOLLA-ANABAENA

Robert Jen, Karan Motiani (Dr. Linda Finke)

Many developing countries use Azolla-Anabaena, an N₂-fixing system, as a fertilizer for aquatic crops. The complex is a symbiotic relationship between the cyanobacterium Anabaena and the water fern Azolla. One potential problem, however, is the application of herbicides. Herbicides are known to suppress the growth of unwanted plants, but its impact on this N₂-fixing system is unknown. Consequently, this study investigated the effects of a herbicide called AquaPro on Azolla-Anabaena by examining whether there was a significant decline in nitrogen-fixing activity and, subsequently, a decline in the growth of the complex. To detect any changes in N₂-fixing activity, the study involved an acetylene reduction assay of Azolla-Anabaena following treatment with Aquapro for one week. Growth was determined by qualitatively measuring the change in surface area coverage by the Azolla plant. Results showed a 98% decrease in N₂-fixing activity and no growth since there was a negative change in surface area.

10:50
TESTING THE ACCURACY OF THE M-RATIO IN DETERMINING POPULATION BOTTLENECK IN A CINCINNATI POPULATION OF PODARCIS MURALIS USING MICROSATellite LOCI

Tracie Duling, Brandyn Hester, Halley Lazarony, Catherine Marcelo (Dr. Waltke Paulding)

A small population of Podarcis muralis lizards were brought to the greater Cincinnati area from Milan, Italy in the 1950’s. The lizards have adapted to the area and continue to successfully propagate. The Lizard population is known to have experienced a bottleneck. Therefore by using this population as a control,
several mathematical equations can be analysed, to see if the equations can predetermine if a given population has experienced a bottleneck. This experiment is intended to use the genetic variability found in the local wall lizard population to determine the validity of such a test. After extracting DNA from the tails of the experimental organisms, three different microsatellite loci were analysed for levels of heterozygosity and observed using capillary electrophoresis. The results of the capillary electrophoresis will be entered into the test, and the results should validate the equations being tested for the presence of a bottleneck population.

11:10
THE EFFECT OF PUBLIC VIEWING ON MIDWEST FLORIDA MANATEE SWIMMING BEHAVIOR
James L. Barlow, Rebecca J. Bruning, Katherine M. Haap, Jason L. Kelty, Matthew D. Niehaus, Avante D. Roberts (Charles J. Grossman)

This project focuses on the two captive male Florida manatees located at the Cincinnati Zoo & Botanical Gardens. The Florida manatee, (Trichechus manatus latirostris) is concentrated in the area of the Florida coastline, residing in both marine and freshwater habitats. The manatee is a very social mammal, often aggregating in groups. The main focus of the study was to observe the swimming behavior of the captive manatees when visitors were present in the viewing area. The viewing glass of the manatee tank was divided up into blocks creating a tape grid system. The swimming behavior of the manatees was then tracked and recorded by observing the number of blocks traversed. It was predicted that the manatees’ swimming behavior would increase significantly when visitors were present in the viewing area of Manatee Springs. Initial observations have shown increased swimming behavior when public viewers were present and statistical analysis is currently being performed to confirm the data is significant.

11:30
THE INVASION OF AMUR HONEYSUCKLE, Lonicera Mackii, AND ITS EFFECTS ON THE SOIL DYNAMICS OF SOUTHWESTERN OHIO’S FORESTS
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XAVIER

Department of Biology
Session Eleven:  Wednesday, April 29, 2009    2:30 p.m.

Section 03 lab

Moderator:  Ms. Tehrani

2:30
TESTING THE ACCURACY OF THE M-RATIO IN DETERMINING POPULATION BOTTLENECK IN A CINCINNATI POPULATION OF PODARCIS MURALIS USING MICROSATellite LOCI
Tracie Duling, Brandyn Hester, Halley Lazarony, Catherine Marcelo  (Dr. Waltke Paulding)

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2:30
THE EFFECTS OF L-TYPE AND T-TYPE CALCIUM CHANNEL INHIBITORS ON SMOOTH MUSCLE CONTRACTION OF LEFT ANTERIOR DESCENDING ARTERY OF BOVINE HEARTS
Laura Borchers, Christine Chuck, Jordan Clendenen, K. Payton Keller, Meredith McAdams, Nina Mecca, Michelle Poineau, and Evan Werk (Dr. Lisa Close-Jacob)

This experiment studied the contribution of different calcium channels to smooth muscle contractions of bovine left anterior descending (LAD) arteries. We examined whether L-type or T-type channels were more responsible for contractile activity using nifedipine and mibebradil as L-type and T-type calcium channel inhibitors, respectively. Arterial rings were hung on force transducers in Krebs solution. The arteries were treated with either the drug or the drug’s vehicle, then contracted with U46619 to observe the effect on overall contraction. The results were gathered using Chart and standardized by determining the force per cross sectional area of each arterial ring. Nifedipine reduced force by 1.654 g/mm², or 41%, relative to the control values. Treatment with mibebradil resulted in a 24% reduction in stimulated force relative to control (0.771 g/mm²). Combining the two inhibitors diminished stimulated force by 25%, a reduction of 0.702g/mm² relative to the control value. These data suggest that L-type calcium channels play a larger role in smooth muscle contraction in LAD arteries of bovine hearts than T-type channels.

3:10
RELATIONSHIP BETWEEN SKULL FORM AND PREY SELECTION IN SNAKES
Ashley H. Rosen (Dr. William Anyonge)

Living snakes are present on every continent, except for Antarctica, and comprise over 2,900
species. Snakes can range in size from 10cm to up to 7.6m. The differences in body size, habitat, and prey preference have resulted in the evolution of a feeding mechanism in snakes that involves the presence of moveable joints within the cranium, allowing the ingestion of prey that surpasses the size of the heads of most snakes. Previous studies have shown the importance of skull shape, size and cranial mobility in determining prey selection. The purpose of this work is to compare the skull morphology in several species of venomous and non-venomous snakes that differ in feeding behavior. It is hypothesized that species that kill and swallow large prey will exhibit enhanced cranial kinesis. This should be reflected in the articulation patterns of individual cranial and mandibular bones, many of which are joined by ligaments. Data has been gathered on individual skull bones of over 50 snakes and is being currently analyzed.

3:30
THE EFFECT OF PUBLIC VIEWING ON MIDWEST FLORIDA MANATEE SWIMMING BEHAVIOR
James L. Barlow, Rebecca J. Bruning, Katherine M. Haap, Jason L. Kelty, Matthew D. Niehaus,
Avante D. Roberts (Charles J. Grossman)

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Session Twelve: Wednesday, April 20, 2009  4:30 p.m.
Section 04 lab

Moderator: Mr. Pecquet

4:30
THE EFFECTS OF L-TYPE AND T-TYPE CALCIUM CHANNEL INHIBITORS ON SMOOTH MUSCLE CONTRACTION OF LEFT ANTERIOR DESCENDING ARTERY OF BOVINE HEARTS
Laura Borchers, Christine Chuck, Jordan Clendenen, K. Payton Keller, Meredith McAdams, Nina Mecca, Michelle Poineau, and Evan Werk (Dr. Lisa Close-Jacob)

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4:50
A RETROSPECTIVE ANALYSIS OF PRIMARY ROTATOR CUFF TEARS WITHIN THE GENERAL POPULATION UTILIZING A NEW CLASSIFICATION SYSTEM
Andrew T. Dornbrook (Dr. William Anyonge)

Classification of rotator cuff tears helps to determine surgical and postoperative management. Current rotator cuff tear classification systems utilize either size or tear type but not usually both to describe tears treated. The purpose of this study is to construct a new classification system that combines tear size and tear type based on information derived from 527 consecutive patients that received surgical repair of a rotator cuff tear by a single surgeon at The Louisville Orthopedic Clinic between 2004 - 2008. Data was collected for tear size, tear type, age, gender, side injured, chronicity, and time from onset of injury to surgery for primary rotator cuff tears. A cross tabulation of the data and a chi square test was performed to determine relationships between variables. One surgeon arthroscopically analyzed each tear to classify tear size and shape according to the new classification system. Significant correlation (p< 0.05) of tear types observed consisted of crescent (58.25%), anterior L (6.83%), posterior L (14.42%), complex (10.06%), u-shaped (9.29%), and split tears (1.13%) and were compared to tear sizes, small (28.84%), medium (28.84%), large (22.20%), and massive (20.11%). In addition there were secondary correlations (p< 0.05) between gender and tear size, tear size and chronicity, age and size, and tear size and tear type. These results have clinical significance in that whereas nearly 60% of tears are crescent shaped, over 40% have a split component requiring margin convergence repair.
This project focuses on the two captive male Florida manatees located at the Cincinnati Zoo & Botanical Gardens. The Florida manatee, (Trichechus manatus latirostris) is concentrated in the area of the Florida coastline, residing in both marine and freshwater habitats. The manatee is a very social mammal, often aggregating in groups. The main focus of the study was to observe the swimming behavior of the captive manatees when visitors were present in the viewing area. The viewing glass of the manatee tank was divided up into blocks creating a tape grid system. The swimming behavior of the manatees was then tracked and recorded by observing the number of blocks traversed. It was predicted that the manatees’ swimming behavior would increase significantly when visitors were present in the viewing area of Manatee Springs. Initial observations have shown increased swimming behavior when public viewers were present and statistical analysis is currently being performed to confirm the data is significant.

5:30
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Abby Strietmann, Andrew Uhling, Sameer Rasa (Dr. Brent Blair)

This study attempted to determine the impact of the invasive species Amur Honeysuckle, Lonicera Mackii, on native soil dynamics in Mt. airy Forest, specifically the nitrogen mineralization rate. Amur Honeysuckle is expected to increase the nitrogen mineralization rate, and thus, the amount of plant available inorganic nitrate (NO₃) in the soil which plants use for photosynthetic and growth processes. To determine the effects of Amur Honeysuckle on soil dynamics, Mt. Airy forest was chosen as the location of study. Soil samples from invaded and un-invaded plots were collected and spectrophotometry was used to determine the nitrogen mineralization rates from the native and invaded soils. Soil pH readings were also conducted. The results of this study indicate that nitrate levels increased and soil pH decreased in invaded soils. The mineralization rate was slightly higher in soils invaded by Amur Honeysuckle but the result was not statistically significant.
Session Thirteen: Thursday, April 30, 2009 8:00 a.m.

Section 05 lab

Moderator: Mr. Nourian

8:00
THE EFFECTS OF L-TYPE AND T-TYPE CALCIUM CHANNEL INHIBITORS ON SMOOTH MUSCLE CONTRACTION OF LEFT ANTERIOR DESCENDING ARTERY OF BOVINE HEARTS
Laura Borchers, Christine Chuck, Jordan Clendenen, K. Payton Keller, Meredith McAdams, Nina Mecca, Michelle Poineau, and Evan Werk (Dr. Lisa Close-Jacob)

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8:20
LONGITUDINAL STUDY INVESTIGATING POSSIBLE CIRCA NNUAL SWIMMING BEHAVIORS OF CAPTIVE FLORIDA MANATEES (TRICHECHUS MANATUS LATIROSTRIS) IN THE MANATEE SPRINGS EXHIBIT AT THE CINCINNATI ZOO
Sara Roper, Allison Tewell (Dr. Charles J. Grossman)

Many animals exhibit circadian or circannual rhythms in their behaviors. To date, it has not been determined if Trichechus manatus latirostris, the Florida manatee, also demonstrates such rhythms in behaviors. This study compared monthly swimming behaviors of five manatees housed in Manatee Springs at the Cincinnati Zoo. Longitudinal data to monitor the movements of manatees in the tank was collected using a grid scheme set-up. A cloth grid was attached to the glass viewing window of the tank and the grid was used to record the blocks traversed by the manatees during a 1-minute run. Data collected over the past nine years was compiled to compare the blocks traversed by each manatee each month. This data was further compared using the Kruskal-Wallis Rank test. Analysis found significant differences in three of the five manatees, in the way their month-to-month swimming behaviors changed. This suggests a possible rhythm to the swimming behaviors of Florida manatees over the course of the year. Further study must expand on the data values and determine if the manatees have increased swimming movements in one season of the year versus another.
9:00
EFFECTS OF SODIUM SULFATE SALINITY ON NITROGEN FIXATION WITHIN THE AZOLLA-ANABAENA SYMBIOSIS
Sean M. Monroe (Dr. Linda Finke)

Nitrogen fixation is the process in which atmospheric nitrogen is reduced to ammonia by the bacterial enzyme nitrogenase. This process occurs within the Azolla-Anabaena symbiosis, where Anabaena provides ammonia for the aquatic fern Azolla that harbors it. Small changes in the aquatic environment can have a dramatic effect on the survival and activity of both symbionts. The challenge of coping with sodium sulfate salinity was the basis for this study. The symbiotic system was exposed to concentrations of Na₂SO₄ between 5 and 15 mM and allowed to grow for three weeks. The acetylene reduction assay was performed weekly to measure nitrogen fixation rates. My hypothesis was that Na₂SO₄ would be detrimental to the survival of the symbionts and would cause an instant decrease in nitrogen fixation activity. However, nitrogenase activity increased at all concentrations of Na₂SO₄ after one week, and only began to decrease in subsequent weeks at higher concentrations.

9:20
Emma Snyder (Dr. Engle)

A serious concern of many healthcare providers is the escalating prevalence of obesity within the pediatric population. A number of diagnosable conditions result from pediatric obesity, which pose further health complications later in life. Commonly associated with obesity is the condition known as fatty liver, which is comprised of an array of conditions. Of these liver conditions, nonalcoholic fatty liver disease (NAFLD) has the highest prevalence within the United States. The aim of this study was to first develop a scale, based on the results the past cases of liver biopsies and images, which would quantitatively measure the severity of liver steatosis based on the echogenicity present on the ultrasound. This scale would serve as a reference for future cases as well as further improve the accuracy and reliability of liver ultrasonography. Results showed that there was minimal correlation between the ultrasonographic findings and histological score. However, statistical analysis showed that there was a strong positive correlation between the quantitative liver echogenicity mean and the histological fat percentage (r=0.67).
Session Fourteen: Thursday, April 30, 2009 10:30 a.m.

Section 06 lab

Moderator: Dr. Matre

10:30

PCR AMPLIFICATION OF FLAMINGO DNA USING RED-NECKED GREBE PRIMERS PROVIDES A RAPID METHOD TO PATERNITY TEST FLAMINGO CHICKS

Stephanie Ibemere (Dr. Waltke Paulding)

Microsatellites are a polymorphic DNA loci comprised of repeating units of 1-6 base pairs. The number of repeating subunits is highly variable between individuals within a population of organisms. Thus, microsatellite DNA can be amplified using PCR and used as genetic markers to differentiate individual organisms in studies of population genetics. Typically, specific PCR primers are synthesized for microsatellite studies in each individual species. Universal primers, which cross-react with multiple species, thus, have wider application. No PCR primers exist for microsatellites in the Greater Flamingo. We are currently performing cross-species microsatellite PCR amplification of Greater Flamingo DNA using Red-Necked Grebe primers, as evolutionary evidence suggests that the two species are closely related enough for the Grebe primers to amplify Flamingo microsatellite DNA. Quantitative results are currently not available, but it is expected that this cross-species amplification will be successful once all conditions have been optimized, providing a rapid method to paternity test Greater Flamingo chicks.

10:50

THE EFFECTS OF L-TYPE AND T-TYPE CALCIUM CHANNEL INHIBITORS ON SMOOTH MUSCLE CONTRACTION OF LEFT ANTERIOR DESCENDING ARTERY OF BOVINE HEARTS

Laura Borchers, Christine Chuck, Jordan Clendenen, K. Payton Keller, Meredith McAdams, Nina Mecca, Michelle Poineau, and Evan Werk (Dr. Lisa Close-Jacob)

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SKELETAL INDICATORS OF LOCOMOTOR BEHAVIOR IN GREAT APES, LESSER APES AND NEW WORLD MONKEYS

Dale A. Parsons (Dr. William N. Anyonge)

Brachiation is locomotion by swinging beneath a superstrate using the pectoral limbs. True brachiators utilize only the pectoral limbs and include only Family Hylobatidae, the gibbons. Semibrachiators use footholds or a prehensile tail in addition to their pectoral limbs and include two genera of New World monkeys and two genera of great apes. The purpose of this study was to analyze differences in skeletal morphology between true brachiators, semibrachiators and phylogenetically-close nonbrachiators. Several measurements were made on the femur, tibia, humerus and radius from at least 5 specimens of genera using MacMorph image analysis software. Brachial and crural indices, as well as the ratio of forelimb-to-hindlimb length, were calculated and subjected to statistical analyses. Data show that true brachiators tend to have greater brachial indices than semibrachiators and nonbrachiators. This suggests that enhanced forelimb length may be an adaptation for habitual arm-swinging locomotion in brachiating species.

PATHOBIOLICAL INSIGHT INTO DIALYSIS ACCESS DYSFUNCTION, NEOINTIMAL HYPERPLASIA, AND VASCULAR STENOSIS

Michelle M. Kurian (Prabir Roy-Chaudhury MD PhD, University of Cincinnati College of Medicine)

Arteriovenous fistula dysfunction is currently an important clinical problem for which there are no effective therapies. One of the reasons for this current lack of effective therapies is a relatively poor understanding of the pathogenesis of venous neointimal hyperplasia. The aim of this study was to describe the pattern of macrophage infiltration and cellular proliferation within the different layers of the vessel wall. 17 venous segment tissue specimens (from patients with dysfunctional AV fistulae) underwent a standard streptavidin biotin immunohistochemical stain for PGM-1 (macrophages) and PCNA (cellular proliferation). Maximal degrees of macrophage infiltration and cellular proliferation were found within the intima-media and the adventitia with lesser degrees of activity within the endothelial layer. These results suggest that both the intima-media and the adventitia are the main sites of cellular activity with regard to the pathobiology of venous stenosis. In particular, the presence of cellular infiltration and proliferation within the adventitia suggests that it may have a role for future perivascular therapies.
Session Fifteen: Thursday, April 30, 2009  12:30 p.m.
Section 07 lab

Moderator: Dr. Matre

12:30
THE ROLE OF GROWTH FACTOR PROTEINS IN CARDIAC HYPERTROPHY OBSERVED IN NEONATAL CARDIOMYOCYTES:
Leandria Thomas, Aiqui Zhao, M.D., Rong Duan, Zikiar Alvin, George E. Haddad, Ph.D.

Cardiac hypertrophy leading to apoptosis has been a major impediment to the treatment and preventative measures against heart failure. To combat its negative effects, the likely key signaling pathways were studied in greater detail. To understand those pathways, different combinations of growth factors were observed in neonatal cardiomyocytes to determine level of protein activity. Our data suggest that IGF-1 increased the activity of Akt in a dose dependant manner, Adenoviral transfection with Ad-Akt does not increase the activity and that PI 3K, enhances the Akt activity.

12:50
INTERCELLULAR SPREAD RATES OF LISTERIA MONOCYTOGENES BETWEEN HUMAN MACROPHAGES AND EPITHELIAL CELLS
Patrick R. Vargo & Paula J. Thielen (Dr. Jennifer Robbins)

The facultative intracellular bacterium, Listeria monocytogenes, has the ability to cause gastroenteritis in healthy individuals, meningitis in immunocompromised individuals, and spontaneous abortions in pregnant women. The intracellular lifecycle of this pathogen has been well documented, but its mechanisms for crossing host barriers and spreading throughout the body remain ambiguous. To investigate the feasibility of L. monocytogenes parasitizing macrophages and using them as a vehicle to spread infection, this study measures the intercellular spread rates of the bacterium between macrophages and epithelial cells.
Macrophages are infected with a RFP (Red Fluorescent Protein) L. monocytogenes strain and cocultured with epithelial cells in a gentamicin solution to facilitate only intercellular spread. Infectious foci and CFUs in the recipient epithelial cells are used to quantify the intercellular spread rate. This procedure is repeated using the following combinations of cocultured cells: infected epithelial cells and uninfected epithelial cells; infected epithelial cells and uninfected macrophages; and infected macrophages and uninfected monocytes. The intracellular spread rates for these combinations are then compared. The results from this study will further elucidate the roles of intercellular spread and infected macrophages in the transmission of L. monocytogenes throughout host tissues.

1:10
TESTING THE EFFICACY OF USING BUCCAL SWABS FOR DNA SAMPLING OF NESTLING MOCKINGBIRDS
Whitney Wauligman (Dr. George Farnsworth)

DNA analysis is a highly utilized means of ornithological studies. DNA sample collection includes various methods such as extraction of DNA from blood, quill ends, and fecal matter, but downsides for these techniques have been noted. Buccal swabs may provide an effective, non-invasive means of DNA sample attainment. The purpose of this experiment was to examine buccal cells processed and analyzed via molecular techniques as a source of DNA for the sexing of Northern Mockingbirds. The results of buccal swab collection and analysis following the QuickExtract DNA Extraction Protocol and single-PCR were inconclusive.

1:30
THE EFFECT OF PUBLIC VIEWING ON MIDWEST FLORIDA MANATEE SWIMMING BEHAVIOR
James L. Barlow, Rebecca J. Bruning, Katherine M. Haap, Jason L. Kelty, Matthew D. Niehaus, Avante D. Roberts (Charles J. Grossman)

This project focuses on the two captive male Florida manatees located at the Cincinnati Zoo & Botanical Gardens. The Florida manatee, (Trichechus manatus latirostris) is concentrated in the area of the Florida coastline, residing in both marine and freshwater habitats. The manatee is a very social mammal, often aggregating in groups. The main focus of the study was to observe the swimming behavior of the captive manatees when visitors were present in the viewing area. The viewing glass of the manatee tank was divided up into blocks creating a tape grid system. The swimming behavior of the manatees was then tracked and recorded by observing the number of blocks traversed. It was predicted that the manatees’ swimming behavior would increase significantly when visitors were present in the viewing area of Manatee Springs. Initial observations have shown increased swimming behavior when public viewers were present and statistical analysis is currently being performed to confirm the data is significant.

1:50
PARA-NODULE FORMATION IN WINTER WHEAT IN ASSOCIATION WITH ANABAENA
Katie E Raffel (Dr. Finke)

Wheat is a basic food source across the world, but its commercial growth demands large amounts of nitrogen fertilizers. This experiment studied the potential for formation of a symbiotic relationship between Anabaena, a nitrogen-fixing cyanobacterium, and roots of Triticum aestivum (winter wheat.) Wheat plants were grown hydroponically in three separate experimental groups: in a nitrogen-free medium, in the same
medium with Anabaena and in the medium, Anabaena, and 2,4-D. 2,4-D served as a synthetic auxin to induce formation of para-nodules on plant roots which would allow for bacteria colonization. Plant growth was monitored by photographic documentation and growth comparisons were based on dry-mass measurements. An acetylene reduction assay was performed to quantify nitrogenase enzyme activity. Para-nodules developed in the wheat plants treated with 2,4-D and the colonization of these nodules by Anabaena resulted in increased nitrogen fixation. There were no significant differences in dry-mass of plants among the experimental groups.

Numerical Discrimination and Foraging Behavior in Northern Mockingbirds.

John P. Chadwell, Christina Baldwin, Warren Leas (Dr. George L. Farnsworth)

When birds are faced with foraging options, optimal foraging theory predicts that they will chose the option that provides the largest reward with the least effort. We tested the ability of a wild Northern Mockingbird (Mimus polyglottos) to optimally choose between two feeders that varied in difficulty of operation and amount of reward provided. In our first trial, the bird was presented with the choice between a feeder with 1 cup and 1 stick, and a feeder with 3 cups and 1 stick. In our second trial, the choice was between a feeder with 1 cup and 1 stick, and a feeder with 1 cup and 6 sticks. In our third trial, one feeder had 1 cup and 1 stick, while the other had 3 cups and 6 sticks. In trials 1 and 2, the bird chose feeders in the manner predicted by optimal foraging theory, preferentially going for more food and fewer sticks, respectively. In the third trial, the bird showed an equal preference for both feeders, with the bird’s preference for more food seemingly acting against its avoidance of more obstacles. These results indicate that the Northern Mockingbird tested exhibited numerical discrimination in regards to both reward and effort.

Intercellular Spread Rates of Listeria Monocytogenes Between Human Macrophages and Epithelial Cells

Patrick R. Vargo & Paula J. Thielen (Dr. Jennifer Robbins)

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individuals, meningitis in immunocompromised individuals, and spontaneous abortions in pregnant women. The intracellular lifecycle of this pathogen has been well documented, but its mechanisms for crossing host barriers and spreading throughout the body remain ambiguous. To investigate the feasibility of L. monocytogenes parasitizing macrophages and using them as a vehicle to spread infection, this study measures the intercellular spread rates of the bacterium between macrophages and epithelial cells. Macrophages are infected with a RFP (Red Fluorescent Protein) L. monocytogenes strain and cocultured with epithelial cells in a gentamicin solution to facilitate only intercellular spread. Infectious foci and CFUs in the recipient epithelial cells are used to quantify the intercellular spread rate. This procedure is repeated using the following combinations of cocultured cells: infected epithelial cells and uninfected epithelial cells; infected epithelial cells and uninfected macrophages; and infected macrophages and uninfected monocytes. The intracellular spread rates for these combinations are then compared. The results from this study will further elucidate the roles of intercellular spread and infected macrophages in the transmission of L. monocytogenes throughout host tissues.

3:10
ENHANCEMENT OF THE SURVIVAL OF ESCHERICHIA COLI IN THE PRESENCE OF THE NITROGEN FIXING AZOLLA-ANABAENAM SYMBIOSIS
Grace E. Hallenbeck and Caitlin A. Richter (Dr. Linda Finke)

The aquatic fern Azolla is used as a biofertilizer because its symbiotic partner Anabaena-azollae fixes atmospheric nitrogen to ammonia, a plant nutrient. Recent public health scares have illustrated the ability of the pathogenic bacterium E. coli O157:H7 to survive in association with leafy vegetables. Is it possible that the nitrogen-fixing activity of the Azolla-Anabaena system, widely grown in rice fields, may support extended survival of fixed nitrogen-dependent pathogens like E. coli? To examine this possibility, Azolla was grown in mineral nutrient media both with and without fixed nitrogen. The activity of nitrogenase, the enzyme responsible for nitrogen fixation, was quantitated by way of the acetylene reduction assay. E.coli was inoculated into systems of both types, as well as into appropriate control solutions. Recovery of surviving E.coli with EMB agar 5 days post-inoculation revealed that the presence of Azolla held no survival advantage to the E.coli.

3:30
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