

# XAVIER

Department of Biology

## Senior Research Symposium

April 24, 25, 26, 27, 2006

Albers Hall - 307

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**Session One: Monday, April 24, 2006 10:30 a.m.**  
Section 01 lab

Moderator: Mr. Nourian

10:30 Introduction

10:40 NON-INVASIVE SEXING OF LOCAL SPECIES OF BIRDS COMPARING THE  
INTRON DIFFERENCES IN THE CHD GENE  
Brandon A. Czekaj, Veronica J. Henry, Kristin M. Kovach, Kristy A. Wallner  
(Dr. Dorothy Engle)

Sex determination in many species of birds is difficult due to no plumage difference between the sexes. A non-invasive way of using DNA provides a method to solve the problem of a lack of morphology. This could be helpful in population studies without affecting population as a whole. Our study is to expand upon the basis of knowledge using local species of birds to add to the list of bird species with which this non-invasive method works. DNA extraction, PCR and gel electrophoresis together have been shown to work in sexing of birds. PCR is a method of amplifying parts of DNA in a test tube. Two primer sets, P2 and P8 and L237L and L272H, were used to amplify homologous parts of sex chromosomes known as the CHD-W and the related CHD-Z resulting in different sized fragments due to amplification of introns in PCR products. Females will produce two bands while males will produce one band, in the 250-350 base pair region.

11:00

THE EFFECT OF INTERLEUKIN-2 ON BRADYKININ-INDUCED RELAXATION OF BOVINE LEFT ANTERIOR DESCENDING CORONARY ARTERIES

Matthew Glassman, Karen M. Hill, Zachary C. Holt, Rishi Jain, Tiffany L. Mazur, Scott E. McDaniel, Allison L. Schreck (Dr. Lisa Close-Jacob)

The effect of interleukin-2 (IL-2) on bradykinin-induced relaxations of bovine vascular tissue was studied, using 3-5mm transverse sections of the left anterior descending coronary artery. It was hypothesized that IL-2 would reduce the magnitude of the force of relaxation upon the addition of bradykinin. Two paired transverse sections from each heart, one receiving the experimental treatment and one the control treatment, were suspended between a rod and force transducer in Krebs solution. These sections were set to a resting tension of between 11 to 13g and allowed to equilibrate. The long-lasting vasoconstrictor, U46619 ( $5 \times 10^{-8} \text{M}$ ), was then added to each chamber. Next, IL-2 (5ng/ml) or its vehicle alone (0.1% bovine serum albumin in phosphate buffer saline at pH 7.4, acting as a control) was added. Five minutes later, bradykinin ( $5 \times 10^{-7} \text{M}$ ) was added to cause relaxation. The developed force upon addition of U46619, the change in force due to IL-2 or its vehicle alone, and the change in force upon addition of bradykinin were measured. Tissues with IL-2 had an average 43.05% relaxation with bradykinin and those with the vehicle alone had an average 48.54% relaxation. These results suggest that the hypothesis that IL-2 reduces bradykinin relaxation was correct.

11:20

EVALUATING THE RELATIONSHIP BETWEEN VHL PROTEIN,  $\text{H}_2\text{O}_2$ - REGULATING ENZYMES, AND OXIDATIVE STRESS

Derek G. Boeh, David A. Dunn, Rita Margevicius, and Elizabeth A. Williams (Dr. Waltke Paulding)

Many environmental factors, including hypoxia, can induce oxidative stress. Cells subjected to oxidative stress often generate reactive oxygen species (ROS), which include hydrogen peroxide ( $\text{H}_2\text{O}_2$ ). Intermittent hypoxia, is a potent stimulator of  $\text{H}_2\text{O}_2$  production. Familial von Hippel-Lindau (VHL) disease develops in individuals that are born heterotrophic for the wild-type (wt)VHL gene, and who subsequently lose the remaining wt-VHL allele due to mutation. Excessive, unregulated quantities of ROS are known to damage cellular macromolecules, including proteins, lipids and nucleic acids. Previous studies showed elevated  $\text{H}_2\text{O}_2$  levels in VHL(-) cells in contrast to VHL(+) cells. We currently investigate expression levels of proteins directly involved in the synthesis/breakdown of  $\text{H}_2\text{O}_2$  in rat renal carcinoma (RCC) and rat pheochromocytoma (PC12) cells under either normoxic (21%  $\text{O}_2$ ) or intermittent hypoxic (1%  $\text{O}_2$ , alternating with 21%  $\text{O}_2$ ) conditions. No results were obtained due to experimental complications. Implications of predicted results will be discussed.

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**Session Two: Monday, April 24, 2006 2:30 p.m.**  
Section 02 lab

Moderator: Mr. Farnsworth

2:30 Introduction

2:40 THE EFFECTIVENESS OF FECAL DNA VERSUS FEATHER DNA IN  
MOCKINGBIRDS AS A MEANS OF NONINVASIVE SAMPLING  
Courtney E. Byrd, Casey L. Owens, Phylesha White (Dr Dorothy Engle)

Feathers have previously been the least invasive source for DNA testing. Unfortunately this procedure involves possible harming of the birds and alteration of their normal activities. Potentially, the least invasive technique for obtaining DNA material would be to collect fecal samples. This study compares the effectiveness of fecal versus feather DNA in mockingbirds from Xavier University's campus. Buccal Amp DNA Extraction Kit and the Extract Master Fecal DNA Extraction Kit were provided by the Epicentre Company to extract the feather and the fecal DNA respectively. PCR was then performed and the amplified DNA samples were run simultaneously on a gel electrophoresis to compare the effectiveness of the sources. It is hypothesized that the fecal DNA results will be as effective an analytical tool as mockingbird feather DNA. If this hypothesis is proven correct, mockingbird feces will provide a noninvasive source for mockingbird DNA, replacing feather DNA as the standard source. The results show that fecal material, as a source of information, is not a reliable tool useful for DNA analysis.

3:00

CHARACTERIZATION OF SEROTONIN RECEPTOR 5-HT<sub>7</sub> IN TWO HUMAN CELL LINES AND MURINE MAMMARY GLAND TISSUE

Ronald T. Auer, **Teresa A. Cash**, Meghan M. Crute, Amanda M. Shoemaker  
(Dr. George A. Jacob)

Mammary gland epithelia produce serotonin in response to prolactin; serotonin may function in an autocrine/paracrine manner in mammary gland involution (Matsuda, *et al.*, 2004). Of the 14 different serotonin receptor subtypes, PCR analysis of mammary gland tissue has shown that 5-HT<sub>7</sub> and 5-HT<sub>1b</sub> receptor mRNA are present. We have used Western blot analysis to probe for the presence of 5-HT<sub>7</sub> receptor protein (50 kDa) in two human mammary gland epithelial cell lines as well as murine mammary glands. Proteins were extracted from cell lines and tissues and quantified using bicinchoninic acid. Proteins were separated via SDS-PAGE, and transferred to PVDF membranes. Membranes were probed with primary antibody raised against 5-HT<sub>7</sub> IgG. Protein bands were visualized using chemiluminescence and exposure to film. 50 and 45 kDa bands were revealed from both human cell line extracts and from human brain tissue lysate (a positive control) confirming the presence of the 5-HT<sub>7</sub> receptor. The murine tissue extracts yielded inconclusive results. The presence of this receptor supports serotonin's role in mammary gland tissue involution following lactation. Future investigations may include confirmation of the presence of other receptor subtypes and the downstream effects of serotonin receptor binding.

3:20

NUMERICAL DISCRIMINATION IN WILD MOCKINGBIRDS (*Mimus polyglottos*)

Hank L. Kerschen, **Sirisha S. Manyam**, Michael B. Horejs (Dr. George L. Farnsworth)

Studies of captive birds in laboratory settings have demonstrated the ability of birds to discriminate between numbers of objects. Such studies often require hours of training in unnatural situations, thus limiting the inferences that can be drawn regarding numerical discrimination in wild birds. In a recent study, our research group introduced five wild northern mockingbirds (*Mimus polyglottos*) to experimental feeders designed to test numerical discrimination. A different number of bamboo sticks could be placed in each of two ends allowing the birds access to a food reward by removing all sticks from either end. Mockingbirds choosing the end with fewer sticks attained the food reward more quickly and easily. After repeated trials all five birds successfully discriminated between 1 and 6 sticks, as well as between 2 and 5 sticks, predominately choosing the end with fewer sticks. However, birds failed to discriminate between 3 and 4 sticks. In that study, birds received a food reward even when they chose the end with more sticks. In the current study, modified feeders prevented subjects from attaining a food reward if they chose the end of the feeder with more sticks. It was hypothesized that the increased cost associated with making the wrong choice would result in the wild birds demonstrating the ability to discriminate between 3 and 4 sticks.

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**Session Three: Monday, April 24, 2006 4:30 p.m.**  
Section 03 lab

Moderator: Dr. Miller

4:30 Introduction

4:40 **ZIC 3 GENE EXPRESSION AND ITS RELATION TO CONGENITAL HEART DEFECTS IN MOUSE EMBRYOS**  
**Catherine M. Huber** (Dr. Stephanie Ware, Cincinnati Children's Hospital Medical Center, Division of Molecular Cardiovascular Biology)

This project attempted to determine if and how the *Zic 3* gene, which establishes proper left-right organ orientation in humans, is expressed in the embryonic heart of wild type mice. The embryos were analyzed at two developmental stages: day 9.5 and day 13.5. The RNA from these embryos was pooled and underwent RT-PCR and gel electrophoresis to determine gene expression. The entire day 9.5 embryo was found to have *Zic 3* gene expression. The heart of the day 13.5 embryo was extracted and underwent the same tests to find that it too expressed the *Zic 3* gene. Day 13.5 embryo hearts were again tested according to the different parts of the hearts: atria, ventricle, and out-flow tract. This portion of the project is still underway to discover if the gene is expressed in the entire heart or select portions.

5:00

NUMERICAL DISCRIMINATION IN WILD MOCKINGBIRDS (Mimus polyglottos)  
Hank L. Kerschen, Sirisha S. Manyam, Michael B. Horejs (Dr. George L. Farnsworth)

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**Session Four: Tuesday, April 25, 2006 8:00 a.m.**

Section 04 lab

Moderator: Mr. Nourian

8:00 Introduction

8:10 CHARACTERIZATION OF SEROTONIN RECEPTOR 5-HT<sub>7</sub> IN TWO HUMAN CELL LINES AND MURINE MAMMARY GLAND TISSUE  
Ronald T. Auer, Teresa A. Cash, Meghan M. Crute, **Amanda M. Shoemaker**  
(Dr. George A. Jacob)

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8:50

CAPTIVE FLORIDA MANATEE BEHAVIORAL RESPONSE TO PUBLIC VIEWING

Amanda Hemmer, Sean Kirby, Michelle Latham, Brid McDonnell, **Katie Rivera**,  
Michael Wehmann, Tony Zak (Dr. Charles J. Grossman)

Behavioral responses of two captive male Florida manatees (*Trichechus manatus latirostris*) at the Cincinnati Zoo (Slip and Little Joe) were studied during different times of the day. Because the construction of the exhibit allows visitors to approach the windows of the tank, the manatees can clearly see and hear people through the glass. Activity data was collected for each manatee when there were people present in the exhibit hall, and this was compared to activity data collected for each manatee when there were no people present in the exhibit hall. When people were present, there was an increase in Slip's activity up to  $\approx 58\%$  and an increase in Little Joe's activity up to  $\approx 50\%$  as compared to the data when there were no people present. Our findings strongly suggest a relationship between the behavioral responses of captive manatees, and the presence of people in the exhibit hall.

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**Session Five: Tuesday, April 25, 2006 10:30 a.m.**

Section 05 lab

Moderator: Mr. Nourian

10:30 Introduction

10:40 EVALUATING THE RELATIONSHIP BETWEEN VHL PROTEIN, H<sub>2</sub>O<sub>2</sub>-REGULATING ENZYMES, AND OXIDATIVE STRESS  
Derek G. Boeh, David A. Dunn, Rita Margevicius, and Elizabeth A. Williams  
(Dr. Waltke Paulding)

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11:00

NON-INVASIVE SEXING OF LOCAL SPECIES OF BIRDS COMPARING THE  
INTRON DIFFERENCES IN THE CHD GENE

Brandon A. Czekaj, **Veronica J. Henry**, Kristin M. Kovach, Kristy A. Wallner  
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VIEWING

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**Michael Wehmann, Tony Zak** (Dr. Charles J. Grossman)

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**Session Six:            Tuesday, April 25, 2006            2:30 p.m.**

Section 06 lab

Moderator:    Mr. Pecquet

2:30            Introduction

2:40            THE EFFECT OF INTERLEUKIN-2 ON BRADYKININ-INDUCED RELAXATION OF BOVINE LEFT ANTERIOR DESCENDING CORONARY ARTERIES  
Matthew Glassman, Karen M. Hill, Zachary C. Holt, Rishi Jain, Tiffany L. Mazur, Scott E. McDaniel, Allison L. Schreck (Dr. Lisa Close-Jacob)

The effect of interleukin-2 (IL-2) on bradykinin-induced relaxations of bovine vascular tissue was studied, using 3-5mm transverse sections of the left anterior descending coronary artery. It was hypothesized that IL-2 would reduce the magnitude of the force of relaxation upon the addition of bradykinin. Two paired transverse sections from each heart, one receiving the experimental treatment and one the control treatment, were suspended between a rod and force transducer in Krebs solution. These sections were set to a resting tension of between 11 to 13g and allowed to equilibrate. The long-lasting vasoconstrictor, U46619 ( $5 \times 10^{-8} \text{M}$ ), was then added to each chamber. Next, IL-2 (5ng/ml) or its vehicle alone (0.1% bovine serum albumin in phosphate buffer saline at pH 7.4, acting as a control) was added. Five minutes later, bradykinin ( $5 \times 10^{-7} \text{M}$ ) was added to cause relaxation. The developed force upon addition of U46619, the change in force due to IL-2 or its vehicle alone, and the change in force upon addition of bradykinin were measured. Tissues with IL-2 had an average 43.05% relaxation with bradykinin and those with the vehicle alone had an average 48.54% relaxation. These results suggest that the hypothesis that IL-2 reduces bradykinin relaxation was correct.

3:00

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**Session Seven: Tuesday, April 25, 2006 4:30 p.m.**

Section 07 lab

Moderator: Dr. Evans-Anderson

4:30 Introduction

4:40 THE EFFECT OF INTERLEUKIN-2 ON BRADYKININ-INDUCED RELAXATION OF BOVINE LEFT ANTERIOR DESCENDING CORONARY ARTERIES  
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5:20

CHARACTERIZATION OF THE BEHAVIORAL PROFILE IN A MURINE MODEL  
OF HURLER SYNDROME

**Anthony Sciascia** (Dao Pan, Cincinnati Children's Hospital)

Mucopolysaccharidosis I is an autosomal recessive lysosomal storage disorder caused by a deficiency of the enzyme  $\alpha$ -L-iduronidase, which is essential for the degradation of the glycosaminoglycans heparan sulphate and dermatan sulphate. The phenotype for the disease can be difficult to predict because it presents a wide array of severity and symptoms. In this study, an attempt is made to profile the behavior of the most severe form of mucopolysaccharidosis I known as Hurler's Syndrome (MPS IH). Age matched and sex matched MPS IH transgenic C57BL6 mice were used in conjunction with normal mice to undergo testing that examined memory, spatial learning, and anxiety during a 6 month period. Significant differences in behavior were found at 6 months age. MPS IH mice consistently gave equal or less attention to a novel object than to a familiar object. The marble burying assessment showed significant differences between genotypes, but not as predicted. The behavior profile obtained from this study will aid in assessing the effectiveness of newly developed gene therapy techniques

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**Session Eight: Wednesday, April 26, 2006 10:30 a.m.**

Section 01 lab

Moderator: Mr. Nourian

10:30 CRANIODENTAL ANALYSIS OF *LONTRA CANADENSIS*, *ENHYDRA LUTRIS* AND *AONYX CINEREA* BASED ON DIET AND PREDATION HABITS.

**Kevin Michael Havlin** (Dr. William Anyonge)

This study investigated craniodental differences of *Lontra canadensis* (North American River Otter), *Enhydra lutris* (Sea Otter) and *Aonyx cinerea* (Asian Clawless Otter) based on diet and predation habits. *Enhydra* and *Aonyx* eat invertebrates caught with the forepaws. *Lontra* feeds on fish caught with its mouth. It was hypothesized *Lontra* would have more mechanical advantage at the front of its mouth, and *Enhydra* and *Aonyx* would have more at the rear. Specimens studied are from the Field Museum in Chicago. Measurements were made using the MacMorph program. ANOVA was used to analyze data. The three species showed no significant differences in relative moment arm length of masseter and temporalis muscles, relative size of masseter and snout length. *Enhydra* had significantly lower mechanical advantage for temporalis and masseter at both molars and canines than the others. *Lontra* was intermediate. *Enhydra* and *Lontra* had similar mechanical advantage of the masseter, significantly lower than *Aonyx*, at the canine. *Enhydra* had a significantly larger temporalis than the others, which are similar size. Unlike the others, *Enhydra* uses rocks to break invertebrate shells, possibly explaining unexpectedly low mechanical advantage of its jaw muscles. *Aonyx* feeds mostly on crabs, *Lontra* on fish, therefore the tougher diet exhibits the highest bite forces.

10:50

THE EFFECT OF ESTRONE ON NITROGEN FIXATION ACTIVITY OF WHITE CLOVERS (*TRIFOLIUM PRETENSE*)

Masooma A. Naqvi (Dr. Linda Finke)

Irrigation of plants with sewage has increased in the past few years because it results in an increase in plant weight and yield. However, sewage contains estrogen, which has been shown to disrupt the process of nitrogen fixation in leguminous plants. The effect of the estrogen compound estrone in the legume white clover was studied in this experiment. Four groups of white clover inoculated with their nitrogen-fixing symbiont *Rhizobium* were established in 4 inch pots in vermiculite. The experimental plants were treated with estrone mixed into a nitrogen free nutrient solution, at one of three concentrations: 0.1ug/L, 0.3ug/L, and 1.0ug/L. The plants were provided with these solutions three times a week, while control plants were watered with tap water and nitrogen free nutrient solution without estrone. To determine the effect of estrone, the dry weights of plants were measured and the rates of nitrogen fixation were compared among the four groups by using the acetylene reduction assay. No significant difference in nitrogenase activity was found in the groups treated with three levels of estrone compared to the control group.

11:10

CAPTIVE FLORIDA MANATEE BEHAVIORAL RESPONSE TO PUBLIC VIEWING

Amanda Hemmer, Sean Kirby, Michelle Latham, Brid McDonnell, Katie Rivera, Michael Wehmann, Tony Zak (Dr. Charles J. Grossman)

Behavioral responses of two captive male Florida manatees (*Trichechus manatus latirostris*) at the Cincinnati Zoo (Slip and Little Joe) were studied during different times of the day. Because the construction of the exhibit allows visitors to approach the windows of the tank, the manatees can clearly see and hear people through the glass. Activity data was collected for each manatee when there were people present in the exhibit hall, and this was compared to activity data collected for each manatee when there were no people present in the exhibit hall. When people were present, there was an increase in Slip's activity up to  $\approx 58\%$  and an increase in Little Joe's activity up to  $\approx 50\%$  as compared to the data when there were no people present. Our findings strongly suggest a relationship between the behavioral responses of captive manatees, and the presence of people in the exhibit hall.

# XAVIER

Department of Biology

## Senior Research Symposium

April 24, 25, 26, 27, 2006

Albers Hall - 307

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**Session Nine: Wednesday, April 26, 2006 2:30 p.m.**

Section 02 lab

Moderator: Dr. Farnsworth

2:30

SURVEY OF LOCAL ISOLATES OF *KLEBSIELLA PNEUMONIAE* AND THEIR ABILITY TO FIX NITROGEN SURVEY OF LOCAL ISOLATES OF *KLEBSIELLA PNEUMONIAE* AND THEIR ABILITY TO FIX NITROGEN

**Brian Entzminger** (Dr. Linda Finke)

*Klebsiella pneumoniae* belongs to the Enterobacteriaceae family, which includes enteric bacteria such as *E. coli*. Some *Klebsiella pneumoniae* strains fix nitrogen under anaerobic conditions but not all species isolated have been capable of doing so. This experiment was conducted in order to test whether naturally occurring *Klebsiella* isolates from the Greater Cincinnati area are able to fix nitrogen if subjected to anaerobic conditions. Environmental samples anticipated to contain *Klebsiella* were collected from two separate sites around the shore of Lake Isabella, two separate sites along the Little Miami River, the pond at Mallard Crossings, a small creek in Indiana, and brewed green tea in sterilized Pyrex screw capped bottles. Swabs were used to collect samples from the human respiratory tract and human stool. Using aseptic means, samples were plated using MCIC agar and a two day incubation period at 37°C to select for *Klebsiella* strains. Colonies of gram (-) rods that were also oxidase (-) were identified using API strips. *Klebsiella oxytoca* and *Citrobacter diversus* strains were isolated. The *Klebsiella* isolates were grown in nitrogen free medium then tested for nitrogen fixation using the acetylene reduction assay.

2:50

THE FORM OF SHARK TEETH AND POSSIBLE IMPLICATIONS OF FUNCTION  
Stephanie N. Wanamaker (Dr. William Anyonge)

This study investigated the tooth shape and overall jaw morphology in relation to feeding behavior in several species of sharks (the tiger and bull shark - Family Carcharhinidae), (the great white shark - Family Lamnidae), and (sand tiger shark - Family Odontaspidae). Results indicated that the Carcharhiniform sharks, though having different numbers of teeth, both showed the same pattern of tooth shape and size throughout the jaws. The teeth toward the jaw joint and toward the center of the upper and lower jaws were quite small in height and width compared to the rest of the teeth. The Lamniform sharks, belonging to different families, had different tooth characteristics. The sand tiger shark had small teeth toward the back of the upper and lower jaws. Although these teeth were too small to measure with digital calipers, they probably function in the grinding of food during feeding. The great white shark had small teeth toward the center and back of the upper and lower jaws but none of these teeth were as small as those present in the sand tiger Shark. Inferences on feeding behavior were evaluated based on the observed tooth patterns.

3:10

CAPTIVE FLORIDA MANATEE BEHAVIORAL RESPONSE TO PUBLIC VIEWING

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# XAVIER

Department of Biology

## Senior Research Symposium

April 24, 25, 26, 27, 2006

Albers Hall - 307

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**Session Ten:            Wednesday, April 26, 2006    4:30 p.m.**

Section 03 lab

Moderator:    Dr. Miller

4:30            THE EFFECT OF INTERLEUKIN-2 ON BRADYKININ-INDUCED RELAXATION OF BOVINE LEFT ANTERIOR DESCENDING CORONARY ARTERIES  
Matthew Glassman, **Karen M. Hill**, Zachary C. Holt, Rishi Jain, Tiffany L. Mazur, Scott E. McDaniel, Allison L. Schreck (Dr. Lisa Close-Jacob)

The effect of interleukin-2 (IL-2) on bradykinin-induced relaxations of bovine vascular tissue was studied, using 3-5mm transverse sections of the left anterior descending coronary artery. It was hypothesized that IL-2 would reduce the magnitude of the force of relaxation upon the addition of bradykinin. Two paired transverse sections from each heart, one receiving the experimental treatment and one the control treatment, were suspended between a rod and force transducer in Krebs solution. These sections were set to a resting tension of between 11 to 13g and allowed to equilibrate. The long-lasting vasoconstrictor, U46619 ( $5 \times 10^{-8} \text{M}$ ), was then added to each chamber. Next, IL-2 (5ng/ml) or its vehicle alone (0.1% bovine serum albumin in phosphate buffer saline at pH 7.4, acting as a control) was added. Five minutes later, bradykinin ( $5 \times 10^{-7} \text{M}$ ) was added to cause relaxation. The developed force upon addition of U46619, the change in force due to IL-2 or its vehicle alone, and the change in force upon addition of bradykinin were measured. Tissues with IL-2 had an average 43.05% relaxation with bradykinin and those with the vehicle alone had an average 48.54% relaxation. These results suggest that the hypothesis that IL-2 reduces bradykinin relaxation was correct.

4:50

THE EFFECTIVENESS OF FECAL DNA VERSUS FEATHER DNA IN  
MOCKINGBIRDS AS A MEANS OF NONINVASIVE SAMPLING  
Courtney E. Byrd, Casey L. Owens, Phylesha White (Dr Dorothy Engle)

Feathers have previously been the least invasive source for DNA testing. Unfortunately this procedure involves possible harming of the birds and alteration of their normal activities. Potentially, the least invasive technique for obtaining DNA material would be to collect fecal samples. This study compares the effectiveness of fecal versus feather DNA in mockingbirds from Xavier University's campus. Buccal Amp DNA Extraction Kit and the Extract Master Fecal DNA Extraction Kit were provided by the Epicentre Company to extract the feather and the fecal DNA respectively. PCR was then performed and the amplified DNA samples were run simultaneously on a gel electrophoresis to compare the effectiveness of the sources. It is hypothesized that the fecal DNA results will be as effective an analytical tool as mockingbird feather DNA. If this hypothesis is proven correct, mockingbird feces will provide a noninvasive source for mockingbird DNA, replacing feather DNA as the standard source. The results show that fecal material, as a source of information, is not a reliable tool useful for DNA analysis.

5:10

BEWARE OF BITE: FORCE COMPARISON OF *Procyon lotor* AND *Didelphis virginiana* USING CRANIAL AND MANDIBULAR MEASUREMENTS  
Nicholas J. Dirig (Dr. William Anyonge)

This study focused on the bite force production of *Procyon lotor* and *Didelphis virginiana*, which are both mainly opportunistic scavengers. Due to their diet, these animals have evolved to produce maximal force in the molar and premolar region for best crushing and grinding performance. In this study, 9 cranial and 8 mandibular measurements were used to determine force production. After computing specific cranial indices, the mechanical advantage of the masseter and temporalis at certain tooth positions were calculated. The size of the masseter and temporalis and various lever-arm lengths were also estimated. Results indicate that *P. lotor* has a larger bite force than *D. virginiana*. The data also show that this higher bite force capability may be due to the shorter snout and larger skull of *P. lotor*, the combination of which allow raccoons to have a slightly larger masseter and temporalis attached to shorter out levers.

# XAVIER

Department of Biology

## Senior Research Symposium

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**Session Eleven: Thursday, April 27, 2006 8:00 a.m.**

Section 04 lab

Moderator: Mr. Nourian

8:00 THE EFFECT OF INTERLEUKIN-2 ON BRADYKININ-INDUCED RELAXATION OF BOVINE LEFT ANTERIOR DESCENDING CORONARY ARTERIES  
Matthew Glassman, Karen M. Hill, Zachary C. Holt, Rishi Jain, Tiffany L. Mazur, Scott E. McDaniel, Allison L. Schreck (Dr. Lisa Close-Jacob)

The effect of interleukin-2 (IL-2) on bradykinin-induced relaxations of bovine vascular tissue was studied, using 3-5mm transverse sections of the left anterior descending coronary artery. It was hypothesized that IL-2 would reduce the magnitude of the force of relaxation upon the addition of bradykinin. Two paired transverse sections from each heart, one receiving the experimental treatment and one the control treatment, were suspended between a rod and force transducer in Krebs solution. These sections were set to a resting tension of between 11 to 13g and allowed to equilibrate. The long-lasting vasoconstrictor, U46619 ( $5 \times 10^{-8} \text{M}$ ), was then added to each chamber. Next, IL-2 (5ng/ml) or its vehicle alone (0.1% bovine serum albumin in phosphate buffer saline at pH 7.4, acting as a control) was added. Five minutes later, bradykinin ( $5 \times 10^{-7} \text{M}$ ) was added to cause relaxation. The developed force upon addition of U46619, the change in force due to IL-2 or its vehicle alone, and the change in force upon addition of bradykinin were measured. Tissues with IL-2 had an average 43.05% relaxation with bradykinin and those with the vehicle alone had an average 48.54% relaxation. These results suggest that the hypothesis that IL-2 reduces bradykinin relaxation was correct.

8:20

THE EFFECTIVENESS OF FECAL DNA VERSUS FEATHER DNA IN  
MOCKINGBIRDS AS A MEANS OF NONINVASIVE SAMPLING

**Courtney E. Byrd**, Casey L. Owens, Phylesha White (Dr Dorothy Engle)

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8:40

THE EFFECT OF NITROGEN FERTILIZERS ON *PHASEOLUS VULGARIS*  
INOCULATED WITH *RHIZOBIUM* BACTERIA

**Patrick W. Spirnak** (Dr. Linda Finke)

In this experiment the impact of different types of fertilizers on the nitrogen fixation capability of the common bean *Phaseolus vulgaris* living symbiotically with the bacterium *Rhizobium* was investigated. Three types of fertilizer with a Nitrogen-Phosphorus-Potassium or N-P-K value of 15-30-15, 12-0-0 and 1-11-0, were used. Two inoculated seeds were planted per 4 inch pot, and each treatment set included 4 pots. All plants were watered with tap water 2-3 times per week. In addition, experimental plants were watered with the fertilizer every other week. Plants were grown until nodules had formed. At this time the root systems were harvested and the nitrogen fixation level of each plant group was determined using the acetylene reduction assay. It was found that the control group, with no fertilizer added, had the highest rate of nitrogen fixation. The groups with the fertilizer added all had little or no evidence of nitrogen fixation according to the acetylene reduction assay.

9:00

COMPARISON OF THE EFFECTS OF 3,4-METHYLENEDIOXYMETHAMPHETAMINE AND 5-METHOXY-DISOPROPYLTRYPTAMINE ON LONG-TERM LEARNING AND MEMORY

**Holly L. Johnson**, Nicole R. Herring, Tori Schaeffer, Curtis E. Grace  
(Dr. Charles Vorhees and Dr. Michael Williams)

This study was designed to determine whether the administration of 3,4-Methylenedioxyamphetamine (MDMA) or 5-methoxy-diisopropyltryptamine (5-Meo-DIPT) would alter long-term learning and memory of neonatal rats when these drugs were administered from postnatal days 11-20, a model for human third trimester development. Male and female Sprague Dawley rats were placed into one of three treatment groups, which included a 10 mg/kg 5-Meo-DIPT group, a 10 mg/kg MDMA group, and a saline group. The Morris water maze (MWM) and the Cincinnati water maze (CWM) were employed to test spatial learning and memory and path integration ability, respectively. In the MWM, the animals that were exposed to 5-Meo-DIPT or MDMA had overall longer latencies to reach the platform than the saline-treated animals. In the CWM, the 5-Meo-DIPT animals performed similarly to the saline animals. However, animals that were exposed to MDMA had longer latencies, more returns to start, and committed more errors than animals that received saline. Therefore, developmental exposure to 5-Meo-DIPT and MDMA produced deficits in spatial learning and memory, whereas animals that were administered MDMA had path integration deficits as well. These results suggest that even though MDMA and 5-Meo-DIPT are structurally similar, the compounds may act through different pathways and/or different regions of the brain.

# XAVIER

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## Senior Research Symposium

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**Session Twelve: Thursday, April 27, 2006**

**10:30 p.m.**

Section 05 lab

Moderator: Mr. Nourian

10:30 Biological Nitrogen Fixation in Yellow, White, and Red Clover  
**Kelly P. Leugers** (Dr. Linda Finke)

Use of ammonium and nitrate fertilizers to increase nitrogen in soil on traditional farms has sped up the eutrophication of lakes due to fertilizer runoff. Leguminous plants have a symbiotic relationship with nitrogen fixing bacteria in root nodules. These plants fix nitrogen into usable compounds and put them back into the soil without contributing to nitrogen runoff. This study surveyed three types of leguminous clover used as cover crops for nitrogen enrichment to establish which type had the most nitrogen fixing activity. Seeds of white clover (*Trifolium repens*), red clover (*Trifolium pratense*), and yellow clover (*Trifolium aureum*) were planted at a seeding rate of 9.44 seeds per square inch. Plants were grown in peat soil for eleven weeks until nodules were mature. Nitrogenase assays were performed using the acetylene reduction technique. Roots were clipped from nine samples of each variety of clover and assayed to determine nitrogenase activity. Red and yellow clover were found to have similar nitrogenase activity and white had significantly less. Knowledge of the clover type with the greatest nitrogenase activity helps farmers choose efficient natural fertilizers for their farms.

10:50

THE EFFECT OF INTERLEUKIN-2 ON BRADYKININ-INDUCED RELAXATION OF BOVINE LEFT ANTERIOR DESCENDING CORONARY ARTERIES

Matthew Glassman, Karen M. Hill, Zachary C. Holt, **Rishi Jain**, Tiffany L. Mazur, Scott E. McDaniel, Allison L. Schreck (Dr. Lisa Close-Jacob)

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11:10

CHARACTERIZATION OF SEROTONIN RECEPTOR 5-HT<sub>7</sub> IN TWO HUMAN CELL LINES AND MURINE MAMMARY GLAND TISSUE

**Ronald T. Auer**, Teresa A. Cash, Meghan M. Crute, Amanda M. Shoemaker (Dr. George A. Jacob)

Mammary gland epithelia produce serotonin in response to prolactin; serotonin may function in an autocrine/paracrine manner in mammary gland involution (Matsuda, *et al.*, 2004). Of the 14 different serotonin receptor subtypes, PCR analysis of mammary gland tissue has shown that 5-HT<sub>7</sub> and 5-HT<sub>1b</sub> receptor mRNA are present. We have used Western blot analysis to probe for the presence of 5-HT<sub>7</sub> receptor protein (50 kDa) in two human mammary gland epithelial cell lines as well as murine mammary glands. Proteins were extracted from cell lines and tissues and quantified using bicinchoninic acid. Proteins were separated via SDS-PAGE, and transferred to PVDF membranes. Membranes were probed with primary antibody raised against 5-HT<sub>7</sub> IgG. Protein bands were visualized using chemiluminescence and exposure to film. 50 and 45 kDa bands were revealed from both human cell line extracts and from human brain tissue lysate (a positive control) confirming the presence of the 5-HT<sub>7</sub> receptor. The murine tissue extracts yielded inconclusive results. The presence of this receptor supports serotonin's role in mammary gland tissue involution following lactation. Future investigations may include confirmation of the presence of other receptor subtypes and the downstream effects of serotonin receptor binding.

# XAVIER

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## Senior Research Symposium

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**Session Thirteen: Thursday, April 27, 2006 2:30 p.m.**

Section 06 lab

Moderator: Mr. Pecquet

2:30 **EFFECT OF DOMINANCE ON SPACE USE IN CAPTIVE FEMALE GORILLAS**  
**Katherine L. Theobald** (Dr. George Farnsworth)

Previous research on juvenile gorillas in a caged exhibit at the Cincinnati Zoo showed that juvenile gorillas limited their space use based on dominance and dominance was determined by weight. I investigated whether weight-based dominance affecting space use would also be observed in a group of young females in a more naturalistic exhibit. I hypothesized the largest juvenile female gorilla would move the least. The exhibit space was divided into uneven zones and the position of the three females was recorded every 30 seconds. The data was analyzed using a modified spread of participation index (SPI). A value of one indicated use of only one zone and a value of zero indicated even use of all the zones. The SPI values were 0.202, 0.293, and 0.332 for Mara, Shanta, and Chewie respectively. The largest female, Chewie, spent 57% of her time in one zone of the exhibit that occupied 24% of the usable exhibit space. Mara and Shanta displayed a more even use of the exhibit zones. These observations showed the most limited use of space by the largest female indicating a weight-based dominance affecting space use.

2:50

## COMPARISON OF SKULL SHAPE IN MARSUPIAL AND PLACENTAL CARNIVORES

Andrea S. Girman (Dr. William Anyonge)

Placental and marsupial carnivores have similar diets, but their methods of consumption differ greatly. This difference can be attributed to variations in teeth, jaw, and skull structure, and therefore jaw strength. Several craniodental indices were computed from measurements taken from skulls and mandibles to evaluate functional similarities and differences in the following species: *Sarcophilus harrisii* (Tasmanian devil), *Dasyurus viverrinus* (Eastern quoll), *Thylacinus cynocephalus* (Tasmanian tiger), and *Crocuta crocuta* (Spotted hyena). It was hypothesized that the Tasmanian devil and Spotted hyena would have the strongest jaws (and jaw musculature) due to their osteophagous feeding habits. There was no significant difference in the relative length of the moment arm of the masseter among the four species. The Tasmanian tiger has a relatively shorter moment arm of the temporalis than the other three species. A similar pattern existed for the length of the temporal fossa. The Tasmanian devil and Spotted hyena exhibited large zygomatic arch widths and temporal fossae that accommodate relatively larger jaw muscles than the quoll and Tasmanian tiger. Surprisingly, the quoll had the highest biting strength (mechanical advantage) of the jaw muscles at the lower canines and first molar. The Spotted hyena and Tasmanian tiger had significantly lower biting strength at both tooth positions whereas the Tasmanian devil was intermediate. There was no significant difference among the four species in biting strength at the second lower premolar. These results suggest that the quoll generates relatively large bite forces at both its canine and lower first molar due to the action of its jaw closing muscles. The Tasmanian devil is a close second. The hyena and Tasmanian tiger produce relatively less force at these teeth. This difference may be attributed to differences in killing and feeding behavior and prey selection among these species.

3:10

## NON-INVASIVE SEXING OF LOCAL SPECIES OF BIRDS COMPARING THE INTRON DIFFERENCES IN THE CHD GENE

Brandon A. Czekaj, Veronica J. Henry, Kristin M. Kovach, Kristy A. Wallner  
(Dr. Dorothy Engle)

Sex determination in many species of birds is difficult due to no plumage difference between the sexes. A non-invasive way of using DNA provides a method to solve the problem of a lack of morphology. This could be helpful in population studies without affecting population as a whole. Our study is to expand upon the basis of knowledge using local species of birds to add to the list of bird species with which this non-invasive method works. DNA extraction, PCR and gel electrophoresis together have been shown to work in sexing of birds. PCR is a method of amplifying parts of DNA in a test tube. Two primer sets, P2 and P8 and L237L and L272H, were used to amplify homologous parts of sex chromosomes known as the CHD-W and the related CHD-Z resulting in different sized fragments due to amplification of introns in PCR products. Females will produce two bands while males will produce one band, in the 250-350 base pair region.

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## Senior Research Symposium

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**Session Fourteen: Thursday, April 27, 2006 4:30 p.m.**

Section 07 lab

Moderator: Dr. Evans-Anderson

4:30 TEMPERATURE AND ITS EFFECT ON NITROGEN FIXATION IN THE *AZOLLA-ANABAENA* SYMBIOSIS

**Bonnie K. Stewart** (Dr. Linda Finke)

The water fern *Azolla* plays an important role in the agriculture of tropical climates. Because of its symbiotic relationship with the cyanobacterium *Anabaena*, *Azolla* can fix nitrogen, making it useful as a biofertilizer. With its success in the tropics, there has been an interest in using it agriculturally in temperate climates. However, long-term exposure to lower temperatures has been found to slow the nitrogen fixation rate of *Azolla*. Research on the effect of acute low temperature exposure on nitrogen fixation in *Azolla* is limited. In this study, *Azolla* cultures grown at room temperature were acclimated for ½ hr to temperatures of 20°C (room temperature), 10°C, 5°C, and 0°C with artificial lighting. A set of cultures was also exposed to natural light at room temperature. Acetylene was then added and nitrogen fixation rates were quantitated using an acetylene reduction assay with reference to an ethylene standard curve. After the assay, *Azolla* samples were dried and weighed to determine dry mass. Nitrogen fixation decreased sharply as temperatures decreased. Under natural light, the rate of nitrogen fixation was significantly greater than that supported by artificial light.

4:50

#### CAPTIVE FLORIDA MANATEE BEHAVIORAL RESPONSE TO PUBLIC VIEWING

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5:10

#### EVALUATING THE RELATIONSHIP BETWEEN VHL PROTEIN, H<sub>2</sub>O<sub>2</sub>-REGULATING ENZYMES, AND OXIDATIVE STRESS

Derek G. Boeh, David A. Dunn, Rita Margevicius, and Elizabeth A. Williams  
(Dr. Waltke Paulding)

Many environmental factors, including hypoxia, can induce oxidative stress. Cells subjected to oxidative stress often generate reactive oxygen species (ROS), which include hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>). Intermittent hypoxia, is a potent stimulator of H<sub>2</sub>O<sub>2</sub> production. Familial von Hippel-Lindau (VHL) disease develops in individuals that are born heterozygous for the wild-type (wt)VHL gene, and who subsequently lose the remaining wt-VHL allele due to mutation. Excessive, unregulated quantities of ROS are known to damage cellular macromolecules, including proteins, lipids and nucleic acids. Previous studies showed elevated H<sub>2</sub>O<sub>2</sub> levels in VHL(-) cells in contrast to VHL(+) cells. We currently investigate expression levels of proteins directly involved in the synthesis/breakdown of H<sub>2</sub>O<sub>2</sub> in rat renal carcinoma (RCC) and rat pheochromocytoma (PC12) cells under either normoxic (21% O<sub>2</sub>) or intermittent hypoxic (1% O<sub>2</sub>, alternating with 21% O<sub>2</sub>) conditions. No results were obtained due to experimental complications. Implications of predicted results will be discussed.