# 31<sup>st</sup> ANNUAL Biological Sciences

UNDERGRADUATE RESEARCH SYMPOSIUM

Friday, April 16, 2021 Virtual Symposium / Webinar 11:00 a.m. – 4:45 p.m.

LOYOLA UNIVERSITY NEW ORLEANS

## 31<sup>st</sup> ANNUAL Biological Sciences

## **UNDERGRADUATE RESEARCH SYMPOSIUM**

11:00	OPENING REMARKS			2:00	15 MINUTE BREAK		
11:15	Payton Alexander	Dr. Rosalie Anderson	Gene expression patterns of <i>Fgf</i> 10 in a joint regeneration model of <i>Gallus gallus</i>	2:15	Olivia Mipro	Dr. Donald Hauber	Impact of price and region on health care attitudes
11:30	Yasmeen Khan	Dr. Allyn Schoeffler Dr. Donald Hauber	Structure-guided bioinformatic analyses of KsgA methyltransferase elucidate determinants of rRNA binding specificity	2:30	Ann-Marie Pham	Dr. Hunter Cole	Genetic engineering of <i>Apilactobacillus micheneri</i> to express lux genes on <i>Helianthus annuus</i>
11:45	Vy Nguyen	Dr. Allyn Schoeffler	Bioinformatic identification of clinically and functionally important sequence elements in Erm proteins	2:45	Tori Rodrigues Susan Thomassie	Dr. Frank Jordan	Ecology of recently introduced population of the Asian swamp eel, <i>Amphipnous cuchia</i>
12:00	Megan Adamson	Dr. Armin Kargol	Hysteresis in potassium ion channels	3:00	Amanda Snyder	Dr. Aimée Thomas	Environmental education in New Orleans City Park
12:15	30 MINUTE BREAK			3:15	Amanda Tang Nian	Dr. Aimée Thomas	Informal teaching: bridging the gap between theory and the real world
12:45	Yasmeen Magharehabed	Dr. Rosalie Anderson	Temporal and spatial expression of Collagen IIa in the regenerating joint	3:30	15 MINUTE BREAK		
1:00	Adelia Obioha	Dr. Rosalie Anderson	The origin of joint regenerative muscle progenitor cells	3:45	Vanessa Sotres	Dr. Patricia Dorn	Ecohealth to address health challenges in Guatemala: the Chagas example
1:15	Glory Tomi John	Dr. Rosalie Anderson	Is normal tendon and ligament development independent of regeneration?	4:00	Gabby Terranova	Dr. Donald Hauber	Phenotypic growth variations as implications of genetic variation in salvinia plants
				4:15	Mikaela Vanek	Dr. Jeffery Gimble Dr. Donald Hauber	The innovation of a quantitative scoring method for skin regeneration
1:30	Ghinna Fondinka		Application of SIB-Similarity and molecular docking computational tools for COVID-19 drug discovery	4:30	Gabriella Weiss	Dr. Rosalie Anderson	BMP9, a regeneration marker: RT-PCR analysis in the chicken embryo
1:45	Stephanie Hoang	Dr. Rosalie Anderson	Assessing the roles of Col III and IX using IHC in the joint regeneration model of <i>Gallus gallus</i>				

## GENE EXPRESSION PATTERNS OF *FGF*10 IN A JOINT REGENERATION MODEL OF *GALLUS GALLUS*

### **PAYTON ALEXANDER**

STUDENT PRESENTER

### **DR. ROSALIE ANDERSON**

**RESEARCH ADVISOR** 

Regeneration is a restoration of the body or body parts because of an injury or interruption to natural processes. Regeneration studies have shown the utilization of heparin-binding Fibroblast Growth Factors (FGFs) in proliferation of cells, tissues, and at the localization of specific anatomical structures in regeneration models. In the case of this research, FGFs are found at the distal apical ectodermal ridge and the subjacent mesenchyme of the developing limb in embryonic models. The embryonic chicken of Gallus gallus was used as a regenerative model of study as this species' developmental and molecular pathways are comparative with humans. The synovial joints of the upper extremities, such as the shoulder and arm, are homologous structures with those of the chicken. The research posed several questions regarding intercalary regeneration of Gallus gallus. The goal is to examine and identify the expression of Fgf10 in the limbs of Gallus gallus through in situ hybridization on regenerating and non-regenerating joints. This expression analyzed at various time points may suggest a role for Fgf10 in the regeneration process of the main bones of the model's wing, the humerus, radius, and ulna. This study will attempt to clarify the regeneration process, more specifically regarding growth factor expression following regeneration of the elbow joint of embryonic Gallus gallus under the assumption that in order to regenerate, a recapitulation of development is necessary.

## STRUCTURE-GUIDED BIOINFORMATIC ANALYSES OF KSGA METHYLTRANSFERASE ELUCIDATE DETERMINANTS OF RRNA BINDING SPECIFICITY

#### YASMEEN KHAN STUDENT PRESENTER

DR. ALLYN SCHOEFFLER

RESEARCH ADVISOR

Post-translational modifications of ribosomal RNA (rRNA) are often necessary for regulating proper ribosome biogenesis. KsgA is a bacterial methyltransferase responsible for catalyzing the methylation of two adjacent adenosine bases on 16S rRNA, A1518 and A1519, located in the ribosome's small 30S subunit. Modification at these positions is unique to this enzyme and is responsible for the proper folding of rRNA. Bioinformatic analysis of the multiple sequence alignment of KsgA methyltransferase from multiple species of bacteria (provided in the Genomic Encyclopedia of Bacteria and Archaea, GEBA-1, set) revealed regions of possible conservation that may be responsible for the substrate specificity of this protein. We suggest that the sequences conserved amongst all bacterial KsgA provided in the GEBA cohort are responsible for KsgA's specificity for the A1518 and A1519 positions. We then compared conserved regions of KsgA and Erm, another methyltransferase whose methylation at a different rRNA position is responsible for causing antibiotic resistance in many bacteria. Comparing these different conserved regions of both enzymes can help us understand the mechanisms by which each methyltransferase develops binding affinity for the appropriate rRNA sequences. Where conservation is matched between both methyltransferases, then the rRNA recognition mechanism is assumed to be shared among homologs. However, where conservation does not match, we propose that the rRNA recognition mechanism is unique to each enzyme and therefore specificity-determining. The data collected in this study can be used in future collaborative experimental investigations to further understand methylation patterns and substrate recognition, which can then be used to design better antibiotics with improved targeting mechanisms.

## BIOINFORMATIC IDENTIFICATION OF CLINICALLY AND FUNCTIONALLY IMPORTANT SEQUENCE ELEMENTS IN ERM PROTEINS

#### **VY NGUYEN**

STUDENT PRESENTER

### **DR. ALLYN SCHOEFFLER**

**RESEARCH ADVISOR** 

Antibiotic resistance is a global challenge, with increasing resistance to antibiotics threatening our ability to treat both human and animal diseases. Use of antibiotics in human and animal medicine has applied selective pressure for the global dissemination of antibiotic-resistant bacteria. The erythromycin resistance methyltransferase (Erm) genes can cause antibiotic resistance in bacteria via rRNA methylation at the peptidyl transfer site of the ribosome, reducing the ability of macrolide antibiotics to bind. The Erm family is diverse; therefore, it is of interest to analyze each subgroup of Erms to understand which residues are conserved across the different clades of the Erm family tree. Here, we evaluate the diversity of Erms from thirteen different clades using bioinformatics. We focused on certain Erm mutation sites that were discovered to be important for the methylation reaction. We further used the new, NIH-sponsored pathogen tracking database MicroBIGG-E to determine the conservation of these important sites in Erm sequences from clinical isolates. Finally, we compare Erm conservation to conservation in KsgA, another methyltransferase that closely resembles Erm in structure yet has a different methylation target site. This strategy could be helpful for the development of antibiotic treatments by helping future research to focus on the most clinically relevant set of amino acids and molecular interfaces in Erms.

## HYSTERESIS IN POTASSIUM ION CHANNELS

**MEGAN ADAMSON** STUDENT PRESENTER

#### **DR. ARMIN KARGOL** RESEARCH ADVISOR

Whole cell voltage clamping of potassium ion channels is used to generate curves of current over time that provide information on the electrochemical activity of potassium ion channels. A whole cell voltage clamp experiment is a patch clamping method where the cell remains attached to a pipette and an intracellular electrode is connected to the cytosol of the cell via a perforation in the membrane within the pipette tip (Kargol, 2019). Voltage is applied according to protocols, programs which specify the magnitude and timing of the voltage changes, and the resultant current across the entire cell is recorded. IV and tails protocols are the commonly used voltage protocols which involve applying voltage jumps between two constant values to detect how ion channels open or close in response to a sudden voltage change. There are multiple models for the function of cell ion channels that fit data from constant voltage protocol patch clamping experiments. Hysteretic loop graphs of current versus voltage generated from applying oscillating voltage protocols could be used to test the validity of existing potassium ion channel kinetic models. Sine, square, and triangular wave voltage protocols were tested, and sine wave voltage protocols generated the best data for analysis. This experimental method and data can be used in future research to support or refute the validity of existing potassium ion channel models.

## TEMPORAL AND SPATIAL EXPRESSION OF COLLAGEN IIA IN THE REGENERATING JOINT

#### **YASMEEN MAGHAREHABED**

STUDENT PRESENTER

### **DR. ROSALIE ANDERSON**

**RESEARCH ADVISOR** 

Cartilage regeneration in adults has been thought to have "zero potential." While different microsurgeries can be performed to induce cartilage regeneration, this connective tissue is unable to heal on its own, resulting in the development of inferior fibrocartilage. Thus, it is crucial to investigate articular cartilage regeneration, especially in light of diseases such as arthritis, which afflicts 1 in 4 Americans. This study investigates the protein, Collagen IIa, which is important because it provides a scaffold for regeneration. Furthermore, the presence of Collagen IIa in the cartilage anlagen indicates chondrocyte differentiation, signifying the start of endochondral ossification. This study investigates the temporal and spatial distribution of Collagen IIa during joint regeneration. Through this, one can understand Collagen IIa's role during regeneration, as it appears before fully developed cartilage exists. Embryonic microsurgeries (Window Excisions) were utilized to trigger cartilage growth during regeneration and immunohistochemistry allowed us to track the presence of Collagen IIa. Chicken embryos were utilized to understand human models. since chicken and human early developmental stages are similar. Through chicken embryos, we can make conclusions about regeneration in humans since the processes correspond in the two organisms. Through this study, I hope to emphasize the importance of Collagen IIa as a factor in regeneration and establish a better understanding of this protein.

## THE ORIGIN OF JOINT REGENERATIVE MUSCLE PROGENITOR CELLS

ADELIA OBIOHA STUDENT PRESENTER

## **DR. ROSALIE ANDERSON**

RESEARCH ADVISOR

Skeletal muscle yields movement. All of life's day to day functions could not be achieved without the contraction of skeletal muscle. The muscle consists of skeletal muscle fibers which, even with the importance and necessity of muscle, cannot divide and regenerate. Several muscular diseases, such as muscular dystrophy, result in stark reduction of muscle mass and can progress to paralysis. Discoveries in the field of muscle regeneration have the potential to actualize new treatments and cures to these diseases, making them a thing of the past. Research is being conducted with animals showing similarities in embryonic development to humans, such as chickens. The question of the origin of regenerative muscle cells remains. It is unclear if the muscle cells migrate from somites, the regions of the embryo that give rise to skeletal muscle, into the limb or if pre-existing stem cell populations proliferate, divide, and combine with muscle cells present in the limb. Both events may occur. This study analyzes the origin of muscle cells that contribute to limb regeneration using immunohistochemistry. We tracked the migratory muscle cells using the antibody MF-20 that recognizes sarcomeric myosin, following a surgical procedure on the chick limb. Our findings suggest that only cell migration takes place.

## IS NORMAL TENDON AND LIGAMENT DEVELOPMENT INDEPENDENT OF REGENERATION?

#### **GLORY TOMI JOHN**

STUDENT PRESENTER

#### **DR. ROSALIE ANDERSON**

**RESEARCH ADVISOR** 

The pathway of embryonic development in tetrapod animals such as humans, frogs, chickens, and fish, is very conserved in the early stages of development. By identifying the different molecular pathways operating that affect gene activation and determining how different pathways affect one another in a model organism, we can theoretically apply this information to humans. Thus, studying the developing chicken limb provides an excellent model to study joint development and regeneration and its potential application in humans. The goal of this study is to understand the cellular and molecular mechanisms that guide patterning of the developing limb in chicks and to discern the factors and conditions necessary to elicit a regenerative response in the limb. This study is focused on identifying tendons and muscles and how their functionality is impacted by regeneration in the chicken limb. This will be achieved by using the MF-20 antibody to sarcomeric myosin and the tenascin C antibody, and an RNA probe, Scleraxis to identify tendons and ligaments. Tissue development will be analyzed in Window Excision (regenerating) and Slice Excision (non-regenerating) chicken limbs. By combining the in situ hybridization and immunohistochemistry protocols and analyzing both Scleraxis and MF-20 on the same sections of the chick wings, we can investigate for overall regeneration, size, and pattern of muscles and tendons, and abnormalities in the experimental wings compared to the controls. We expect that although muscle, tendon and ligament development would continue during joint regeneration, it would be impacted and thus would not be normal.

## APPLICATION OF SIB-SIMILARITY AND MOLECULAR DOCKING COMPUTATIONAL TOOLS FOR COVID-19 DRUG DISCOVERY

### **GHINNA S. FONDINKA**

STUDENT PRESENTER

ELAHE MAHDAVIAN, M.SC., PH.D., LSU SHREVEPORT RESEARCH ADVISOR

**DR. ROSALIE ANDERSON AND DR. JEREMY THIBODEAUX** RESEARCH SPONSORS

The onset of the COVID-19 pandemic and its significant effects on human health and the economy have led to an urgent need for effective therapeutics. Promising drug candidates that could disrupt the interactions of CoV-2 spike protein with human ACE-2 protein (PDB:ID 6MOJ) can block viral entry and lower infections. Our approach relied on various Computer Aided Drug Discovery (CADD) methods to identify promising COVID-19 therapeutics based on a broad-spectrum antiviral drug known as Arbidol. An Arbidolbased compound library was built using SIB Similarity modeling tool, with a focus on the CHEMBL, ZINC and Virtual libraries. Analogs that had either undesirable drug-like properties, over-promiscuous, or frequent hitters (tools: SWISS-ADME, PAINS), were identified and filtered out. Then analogs that shared significant structural similarity with Arbidol based on either FP2, electroshape or spectrophore metrics and had the best ADME properties were selected for virtual molecular docking experiments. The topranked analogs were selected and then run through molecular docking experiments with 6MOJ using Auto Dock Vina. Future work will include the analysis of binding energies and interaction modes in compound-6MOJ complexes and to further prioritize compounds for *in-vitro* validation. The ultimate goal is to select drug candidates that can serve as promising inhibitors of the SARS-CoV-2 viral infectivity mechanism.

## ASSESSING THE ROLES OF COL III AND IX USING IHC IN THE JOINT REGENERATION MODEL OF *GALLUS GALLUS*

#### **STEPHANIE HOANG**

STUDENT PRESENTER

#### **DR. ROSALIE ANDERSON**

**RESEARCH ADVISOR** 

The human body is supported by a skeletal framework composed of bones connecting at the articular surfaces of synovial joints. Synovial joints are vulnerable to trauma and deterioration from aging, and damaged joints can lead to severe debilitation. Currently, the primary treatment option is to replace the damaged joint with a prosthetic implant, which is invasive and could lead to further health complications. Our research is focused on seeking an alternative treatment method for humans to be able to regenerate the damaged joint on their own. Given that humans and chickens have homologous genes and structures, the experimental model used in this study is the Gallus gallus chicken embryo so that the joint regeneration mechanisms seen in chicks could be potentially applicable towards humans. Col III and IX, the proteins of interest in this study, are expressed in the joints of both chickens and humans. The aim of this study is to determine the specific roles of Col III and IX in the joint developmental process. The use of immunohistochemistry enables the expression of the two proteins to be mapped on the histological sections of control embryos and experimental embryos that have undergone elbow joint excisions and fixed at specific time points. Analysis of the differences in protein expression between the embryos, if any, may contribute to a more comprehensive understanding of the proteins' roles in the joint regeneration process.

## IMPACT OF PRICE AND REGION ON HEALTH CARE ATTITUDES

**OLIVIA MIPRO** STUDENT PRESENTER

## **DR. DONALD HAUBER**

**RESEARCH ADVISOR** 

Healthcare prices have long been a problem in America; the U.S has one of the most expensive systems in the world. This high cost is not due to superior healthcare; up to one-guarter of healthcare spending has been shown to be wasteful. Given this, it is important to see how people feel about the care they are receiving, as well as look at the impact of price on healthcare attitudes. This can be done through examining regional differences in healthcare prices and attitudes around healthcare. The central questions asked were how attitudes towards healthcare vary by census region (Northeast, South, Midwest and West), as well as how census region impacts healthcare prices. This was done through analysis of two datasets that were downloaded, one from the RAND Corporation report, "Nationwide Evaluation of Healthcare Prices paid by Private Health Plans," and one from the Pew Research Center, American Trends Panel, Wave 34. Health care price by region was gained through the RAND Corporation dataset, while attitudes around healthcare was taken from the Pew Research Center survey dataset. Data was entered into SPSS statistics, where a One-Way ANOVA with a Tukey HSD test was run to determine how relative price varied by region. Additionally, a Pearson's Chi-Square Test and Kruskal-Wallis Test with Pairwise comparisons were used to determine the effect of census region on attitudes towards healthcare. There was no significant variance in healthcare price by region while there was a significant difference in attitudes towards healthcare.

## GENETIC ENGINEERING OF APILACTOBACILLUS MICHENERI TO EXPRESS LUX GENES ON HELIANTHUS ANNUUS

#### **ANN-MARIE PHAM**

STUDENT PRESENTER

## **DR. HUNTER COLE**

**RESEARCH ADVISOR** 

Several studies have been reported of genetically engineering flowers into an autoluminescent plant, however, reconstructing a bacterium to express bioluminescence on a flower remains to be accomplished. Epiphytic bacterial communities colonizing plant surfaces, such as the Lactobacillus species, are a common niche for flowers to maintain their microbiomes. In addition, the replication and transformation of Lux genes have been engineered into a variety of different organisms to generate new luminescent species. This experiment aims to implement genetically engineering a plasmid using techniques such as the polymerase chain reaction that will allow expression of the Lux genes. Transformation via electroporation of the plasmid into Lactobacillus micheneri will introduce the Lux genes. As a result, the transformed bacterium is affixed to Helianthus annuus and observed for the longevity of its lifespan, indicated by the bacterium's duration of glow on the surface of the flower petal. Photobacterium phosphorium, a bacterium that naturally glows in the gut of a Pacific Rockfish due to the Lux genes will be applied to the flower and monitored over time as a control. The cloning and expression of the Lux genes have led to significant advances in our knowledge of the molecular biology of bacterial bioluminescence. The ability to express the Lux genes in a bacterium demonstrates the considerable potential of the widespread application of the Lux genes as reporters of gene expression.

## ECOLOGY OF RECENTLY INTRODUCED POPULATION OF THE ASIAN SWAMP EEL, *AMPHIPNOUS CUCHIA*

### VICTORIA RODRIGUES AND SUSAN THOMASSIE STUDENT PRESENTER

#### **DR. FRANK JORDAN** RESEARCH ADVISOR

Cuchia (Amphipnous cuchia) is a species of obligate air-breathing Synbranchiform eel native to Southeast Asia that was discovered in Bayou St. John in New Orleans in June 2019. We studied the invasion dynamics of this recently introduced species during the past two years by quantifying distribution and abundance at ten sites throughout Bayou St. John, three sites in City Park, and two nearby sites in Lake Pontchartrain. Sampling methods included dip netting, seining, removal and inspection of littoral vegetation, throw trapping, and deployment of leaf packs and minnow traps. We collected several age and size classes of Cuchia in both 2019 and 2020. Presence of young-of-year during both years indicates this is the first successfully reproducing population established in the United States. Distribution has increased modestly in Bayou St. John during the past two years, but Cuchia have not yet been detected in the lagoons of City Park or nearby sites in Lake Pontchartrain. Laboratory experiments indicate that young-of-year are tolerant of salinities typical of the Lake Pontchartrain Estuary. Range expansion into the Lake Pontchartrain Estuary and potentially the Mississippi River Basin is of concern because Cuchia is an opportunistic predator that is difficult to control or eradicate because it is resistant to ichthyocides and occupies vegetated and fossorial habitats that are extremely difficult to sample. Data on abundance, distribution and ecology of Cuchia will help inform methods for future management and monitoring.

## ENVIRONMENTAL EDUCATION IN NEW ORLEANS CITY PARK

AMANDA SNYDER STUDENT PRESENTER

#### **DR. AIMÉE THOMAS** RESEARCH ADVISOR

RESEARCH ADVISOR

Environmental education serves to inform learners of relevant environmental concepts, while also attempting to foster personal connections to the environment. While plenty can be learned inside of a classroom about the environment, work in the field makes it easier to show, rather than tell about real life ideas. This belief of learning out in nature making it easier to conceptualize ideas is exactly what fueled my work in New Orleans City Park. New Orleans City Park is a 1300-acre park with attractions ranging from golf courses to amusement parks to a 60-acre forest. I was an environmental education intern, working with others to create a curriculum for students of all ages to come to the park and learn about nature. Most of our work focused on Couturie Forest, where we developed many educational programs. These programs include an educational forest tour and camping trips to the forest with activities for students, such as bat walks and black-light bug activities. This project is centered around the environmental education activities and research performed to create these tours to include the most relevant information while allowing students to appreciate nature.

## INFORMAL TEACHING: BRIDGING THE GAP BETWEEN THEORY AND THE REAL WORLD

AMANDA TANG NIAN STUDENT PRESENTER

#### **DR. AIMÉE THOMAS** RESEARCH ADVISOR

Informal teaching is a pedagogical method that engages students in hands-on learning outside of the classroom. Within the discipline of environmental science, informal teaching allows students to become immersed in the natural world seen in their textbooks and formal education. This teaching method also helps different types of learners, such as tactile and visual learners, make links between the theory they learn in the classroom and their real world experiences to better understand environmental science concepts. As an aspiring environmental educator, my interest in informal teaching as an adjunct to formal education allowed me to pursue an internship at New Orleans City Park as an environmental educator. One of my roles as an environmental education intern was to design outdoor activities to help teach students at all education levels about ecosystem services, native species of flora and fauna, and the natural environment of the park. With the help of colleagues at the park, we were able to host forest tours and campouts that involved activities that facilitated learning. This work will detail the environmental science informal teaching activities that were created and tailored to various age groups .

## ECOHEALTH TO ADDRESS HEALTH CHALLENGES IN GUATEMALA: THE CHAGAS EXAMPLE

#### **VANESSA KIARA SOTRES**

STUDENT PRESENTER

## **DR. PATRICIA DORN**

RESEARCH ADVISOR

Neglected tropical diseases (NTDs) largely affect Latin American populations of lower socioeconomic classes. Research into solutions to NTDs are underfunded, and most healthcare facilities are not accessible or available to provide treatment for such diseases to those most affected. Therefore, an Ecohealth approach is being implemented to seek preventative measures against NTDs, by considering an affected population's culture, socioeconomic state, and environment. By using an ecohealth approach, I will analyze the factors that put certain Guatemalan populations at greater risk for Chagas disease and how treatment is economically dependent.

## THE INNOVATION OF A QUANTITATIVE SCORING METHOD FOR SKIN REGENERATION

### MIKAELA VANEK STUDENT PRESENTER

## **DR. DONALD HAUBER**

**RESEARCH SPONSOR** 

### **DR. JEFFERY GIMBLE M.D., PH.D., OBATALA SCIENCES** RESEARCH ADVISOR

Within the market of in vivo pressure ulcer studies, Obatala aims to simplify the analysis of data to be as comprehensive and concise as possible. We have created a scoring method for clientele to understand the regeneration of the given tissue by averaging the data into a single number for each section. The idea was adapted from an article written by Galeano et. al. Our scoring method for skin regeneration includes the average measurements of the epidermis, dermis, and adipose tissue as well as the neovascularization and granulation per area. These measurements have allowed us to quantify and score each section of tissue. These scores will deliver the client the regeneration rates of their tissue samples while increasing efficiency, functionality, and business marketing for Obatala.

## BMP9, A REGENERATION MARKER: RT-PCR ANALYSIS IN THE CHICKEN EMBRYO

## NOTES

#### **GABRIELLA WEISS**

STUDENT PRESENTER

### **DR. ROSALIE ANDERSON**

RESEARCH ADVISOR

Bone morphogenetic protein 9 (BMP9) is the most poorly characterized member of the BMP family even though it has been shown to be involved in joint regeneration, specifically cavitation, chondrogenesis, and regeneration of the synovial cavity in common animal models, such as mice. The purpose of this study was to identify BMP9 expression in Gallus gallus (chicken embryos). This is an ideal animal model due to how easily these embryos can be accessed and surgically manipulated. mRNA from chicken embryos at various stages of development were used in a number of molecular biology techniques, including reverse transcriptase-polymerase chain reaction (RT-PCR), cloning and transformation of recombinant DNA, plasmid preparation, plasmid DNA guantification, and bioinformatic analysis of sequencing results using NCBI BLAST, in order to identify BMP9 expression. Bioinformatic analysis confirmed that the cloned gene sequence was BMP9 from Gallus gallus; therefore, BMP9 is present in the early stages of chicken embryonic development. The identification of the stages of development that BMP9 is present is significant as it provides evidence that BMP9 plays an important role in early embryonic development; however, more research needs to be done to fully understand its role in joint regeneration, and therefore, the biomedical implications for humans.



NOTES	NOTES

## 31<sup>ST</sup> ANNUAL Biological Sciences UNDERGRADUATE RESEARCH SYMPOSIUM

Today we celebrate the 31st year of this annual, seminal event at Loyola where students from biology and other natural sciences present their undergraduate research projects. These outstanding students have enhanced their undergraduate experiences by taking on directed research and creative activity under the supervision and mentorship of some of Loyola's most distinguished faculty as well as faculty from partner institutions. If you are attending this event as a student, we hope you will be inspired to develop your own research or creative projects. We invite you to visit our website at **loyno. edu/biology** to learn about the many ways undergraduates can get involved with research here at Loyola. For more information about contributing to undergraduate research experiences, please contact Karen E. Anklam, Major Gifts Officer, Development/Capital Campaigns Department at **(504) 861-5423** or **keanklam@loyno.edu**.

### SPECIAL THANKS

We would like to offer our special thanks to our donors for their continued support of this event through the Rev. J. H. Mullahy Undergraduate Research Fund, Biology Gift Fund, and the Dr. Jean DeKernion Undergraduate Research Fund.



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