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Ronald E. McNair Undergraduate Research Journal - 2010

Cohort 7

F L O R I D A I N T E R N A T I O N A L U N I V E R S I T Y

Ronald E. McNair Post-Baccalaureate Achievement Program

Undergraduate Research Journal
Summer 2010

FIU | FLORIDA INTERNATIONAL UNIVERSITY

CONTENTS

McNAIR POST-BACCALAUREATE ACHIEVEMENT PROGRAM

The McNair Program was established at FIU in 2002 and since that time has inducted over 200 undergraduate students majoring in the different STEM fields of study.

Congress established a series of programs, funded under Title IV of the Higher Education Act of 1965, to help low-income Americans enter college, graduate and ultimately progress to become experts in their field. The Ronald E. Post Baccalaureate Achievement Program was established in 1986. The McNair program was named after Ronald E. McNair who passed away during the explosion of the Challenger Space Shuttle on January 28th, 1986. Its primary goal is to increase the number of Ph.D. students among groups under-represented in graduate education. Presently, there are over 156 academic institutions that house the McNair Program. Benefits of the program include faculty mentorship, opportunities to present research at various graduate school enrollment opportunities, and a generous stipend.

The Ronald E. McNair program prepares students from disadvantaged backgrounds who have demonstrated strong academic potential for doctoral studies through involvement in research and other activities. The McNair program works closely with students as they complete their undergraduate requirements. The program also encourages students to enroll in graduate programs and then track their progress through successful completion of advanced degrees. The goal of the McNair program is to provide enriching scholastic experiences that prepare eligible scholars for doctoral (Ph.D.) education. To this end, participants are given the unique opportunity of developing the highest-level academic and research skills needed for successful admission to and completion of a Ph.D. program. McNair scholars are eligible for the following services until they complete their baccalaureate degree: academic counseling, financial aid assistance, mentoring, research opportunities, seminars, summer internships, and tutoring. Furthermore, program staff will always be ready to provide moral support, advice and guidance to all McNair alumni throughout their graduate years as they pursue their doctoral degrees.

DR. RONALD ERWIN McNAIR

The McNair Program is named in honor of Dr. Ronald E. McNair, the laser physicist and Challenger space shuttle astronaut. McNair graduated magna cum laude from North Carolina Agricultural and Technical State University in 1971 and received his Ph.D. from Massachusetts Institute of Technology in 1976. He was selected by NASA for the space shuttle program in 1978 and was mission specialist on the successful 1984 Challenger flight before his death in the space shuttle accident of 1986. Those who knew Ronald McNair characterized him as fearless, determined, and accustomed to applying all available resources to any problem he faced.

Ronald E. McNair was the second of three mission specialists aboard Challenger. Born on October 21, 1950, in Lake City, South Carolina, McNair was the son of Carl C. McNair, Sr., and Pearl M. McNair. He achieved early success in the segregated public schools he attended as both a student and an athlete. Valedictorian of his high school class, he attended North Carolina A&T State University where in 1971 he received a B.S. degree in physics. He went on to study physics at Massachusetts Institute of Technology, where he specialized in quantum electronics and laser technology, completing his Ph.D. in 1977. As a student he performed some of the earliest work on chemical HF/DF and high pressure CO lasers, publishing path breaking scientific papers on the subject.

McNair was also a physical fitness advocate and pursued athletic training from an early age. He was a leader in track and football at his high school. He also became a black belt in Karate, and while in graduate school began offering classes at St. Paul's AME Church in Cambridge, Massachusetts. He also participated in several Karate tournaments, taking more than 30 trophies in these competitions. While involved in these activities, McNair met and married Cheryl B. Moore of Brooklyn, New York, and they later had two children. After completing his Ph.D. he began working as a physicist at the Optical Physics Department of Hughes Research Laboratories in Malibu, California, and conducted research on electro-optic laser modulation for satellite-to-satellite space communications.

This research led McNair into close contact with the space program for the first time, and when the opportunity presented itself he applied for astronaut training. In January 1978 NASA selected him to enter the astronaut cadre, one of the first three Black Americans selected. McNair became the second Black American in space between February 3 and 11, 1984, by flying on the Challenger shuttle mission STS-41-B. During this mission McNair operated the maneuverable arm built by Canada used to move payloads in space. The 1986 mission on which he was killed was his second Shuttle flight

Dr. McNair graduated magna cum laude from North Carolina A&T ('71) - named Presidential Scholar ('67-'71), Ford Foundation Fellow ('71-'74), National Fellowship Fund Fellow ('74-'75), NATO Fellow ('75) - winner of Omega Psi Phi Scholar of Year Award ('75), Los Angeles Public School System's Service Commendation ('79), Distinguished Alumni Award ('79), National Society of Black Professional Engineers Distinguished National Scientist Award ('79), Friend of Freedom Award ('81), Who's Who Among Black Americans ('80), an AAU Karate Gold Medal ('76), 5 Regional Black belt Karate Championships. Dr. Ronald E. McNair died on January 28, 1986 when the Space Shuttle Challenger exploded after launch from the Kennedy Space Center, Florida.

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November 18, 2010

Dear Reader:

I am pleased to offer this publication representing the research activities of the Ronald E. McNair Postbaccalaureate Fellows at Florida International University. In its second cycle of funding from the United States Department of Education, the McNair program has served well over eighty students, many of whom are enrolled in masters and doctoral (Ph.D.) programs at some of the nation's most prestigious institutions of higher learning.

Central to the core mission of Florida International University is the provision of high quality undergraduate research experience for its students. FIU is quite fortunate to be the recipient of only four Ronald E. McNair Postbaccalaureate Achievement grants in the state of Florida and the only one in Miami-Dade County. The central mission of the McNair program is to expose our undergraduate students to cutting edge research conducted by world class faculty. Each year FIU selects twenty-two such students and pairs them with faculty involved in scientific research in a variety of STEM disciplines—Engineering, Biomedical Engineering, Chemistry, Physics, Mathematics, etc.

It goes without saying that the entire staff of the McNair program here at FIU is extremely proud of the many achievements of our McNair Fellows. It is for this and other reasons that we gladly share with you this publication which aptly describes some of the research activities of our McNair students. In am certain that you will find the reading of the research papers as enjoyable and enlightening and I did when I first read them.

Sincerely,

Dr. E. George Simms
Director, Pre-Collegiate, Grants
& Ronald E. McNair Programs

FIU | **FLORIDA INTERNATIONAL UNIVERSITY**

E. George Simms
Director of Pre-Collegiate Programs and Grants
Florida International University
MARC 414

Dear Dr. Simms,

I am pleased to introduce the Florida International University Ronald E. McNair Research Publication. The document illustrates some of the outstanding research activities of our McNair students.

In its second cycle of funding from the United States Department of Education, the McNair program makes it possible for a select group of students to engage in high quality research under the tutelage and guidance of world class research faculty. FIU is the only McNair grant recipient in South Florida.

McNair Students typically have economically disadvantaged backgrounds but demonstrate strong academic potential. The goal of the McNair program is to increase the number of FIU students majoring in Science Technology Engineering and Mathematics disciplines (STEM) who subsequently obtain PhD degrees.

In its brief history, the FIU McNair program has already established itself as a highly successful program with many of its graduates publishing their research in highly respected scientific journals and pursuing graduate degrees at leading research universities.

Regards,

Dr. Douglas Wartzok
Executive Vice President and Provost

FIU | FLORIDA INTERNATIONAL UNIVERSITY

November 20, 2010
Dr. E. George E. Simms
Director of Pre-Collegiate Programs
Florida International University
University Park, MARC 414
Miami, FL 33199

Dear George,

I extend my sincere congratulations to the students and staff of the Ronald E. McNair Post Baccalaureate Achievement Program on the publication of the research activities of the McNair Fellows. It is evidence of the hard work and dedicated efforts of both the faculty mentors and students alike. Graduate education and research are extremely valuable, and the research experience the McNair program provides will undoubtedly bode well for any graduate endeavor. The program has successfully prepared program participates from disadvantaged and underrepresented groups for doctoral education.

The unique opportunity afforded by the FIU McNair Faculty is paramount to assist and support low income, first generation college students, and those from underrepresented groups in pursing doctoral studies.

I congratulate each of our McNair Fellows, and wish them continued success in all future endeavors.

Sincerely,

Kevin O'Shea, Ph.D.
Dean of the University Graduate School

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Dear Ronald E. McNair Students, Faculty and Staff:

On Behalf of the Division of Student Affairs, I am pleased to offer my congratulations to the Ronald E. McNair program on the publication of the McNair Research Journal. This document represents what I hope will be many publications produced by the McNair program. This premier publication contains a significant body of work by some of Florida International University's finest scholars. It represents what happens when students and faculty work together collaboratively to explore and solve problems of an academic nature. It is indeed the embodiment of teaching and learning at its best. It is for this reason that Florida International University is honored to be the recipient of the Ronald E. McNair program.

Critical to the success of the McNair program and any student directed research is the involvement of dedicated faculty mentors who frequently provide guidance, encouragement and support to each student. We are extremely thankful and appreciative to those faculty members who have opened their laboratories and welcomed our students.

As we begin the second cycle of funding of the McNair program, I look forward with great anticipation and excitement to the program continuing to provide quality research opportunities for some of FIU's best and brightest students.

Congratulations and best wishes in the coming year!

Rosa L. Jones, D.S.W.
Vice President, Student Affairs

FIU FACTS AT A GLANCE

FLORIDA INTERNATIONAL UNIVERSITY is Miami-Dade County's first public, four-year university. Our powerful record of innovation and research continues to improve the quality of life in our **communities.**

HISTORY AND GROWTH: FIU was founded in 1965 and opened for classes in 1972 with 5,667 students – the largest opening day enrollment in U.S. collegiate history. Today it has more than 42, 000 students, almost 1,000 full time faculty and more than 150,000 alumni. FIU is one of the 25 largest universities in the nation, based on enrollment. The University offers more than 200 bachelors, masters and doctoral programs in 21 colleges and schools.

FACULTY: Ninety-five percent of the University's full-time, tenured, and tenure earning faculty hold doctorates or the highest degree attainable in their field.

RESEARCH: FIU emphasizes research as a major component of its mission. Sponsored research funding (grants and contracts) from external sources for the year 2005-2006 totaled $92 million. The University is ranked as a Research University in the High Research Activity category of the Carnegie Foundations prestigious classification system.

NATIONAL RECOGNITION: FIU is the youngest University to have been awarded a chapter of Phi Beta Kappa, the Nation's oldest and most distinguished academic honor society. FIU recently ranked among the best values in a public higher education in the country, according to Kiplinger's Personal Finance magazine's 2006 survey, "100 Best Values in Public Colleges." FIU ranked among the top 5 nationally for in-state students and among the top 100 nationally for out-of-state and international students.

FIU recently ranked 3rd in granting bachelor degrees to minorities and 9th in granting masters degrees to minorities (among the top 100 degree producing colleges and universities), according to Diverse Issues in Higher Education, June 1, 2006.

FIU's College of Law led all the universities in the state with the highest pass rate of 94.4% on the 2007 Statewide Florida Bar Examination. The second highest pass rate belonged to Florida State University with 88.2%.

U.S. News & World Report ranks FIU's undergraduate international business program among the top 15 in the nation and their graduate program among the top 25. The University has also been named one of the "10 Cool Colleges for Entrepreneurs" by Fortune Small Business magazine. Our Executive MBA program was recently ranked in Florida by the Financial Times.

The School of Hospitality and Tourism Management is one of the nation's top programs. Other acclaimed programs include Creative Writing and Marine Biology.

FELLOW PRESENTER INDEX

FELLOW PRESENTER INDEX (cont.)

Marina Ines Acevedo

I was born in Miami Florida in the summer of 1988, into a humbled immigrant family which now consisting of both my parents and my paternal grandmother and a younger brother. Growing up in an Argentine family truly had its benefits from eating great food to falling in love with soccer. Living in a Spanish speaking home, I did not have the ability to practice English and at a very young age I was placed in an English remedial class (ESOL). Being places in this class was unfortunately keeping me from showing my true potential in other subjects. Learning a new language for the first time, along with your parents, is not easy but it was something I knew I had to surpass to be able to succeed. Thanks to the help of my teachers and to the dedication and effort put further both by my mother and myself, I was able to get out of ESOL. My parents always made it clear to me that the ability to succeed was and will always be within me, but the dedication that I was willing to put forth is what would always allow me to reach my goals. Being able to surpass this hurdle has opened a world of possibilities for me.

Incredibly, due to my new accomplishments and my high scores in both math and science, in less than 2 years my life had turned 180 degrees. In middle school and high school I was taking Honors, AP and International Baccalaureate classes. I was also active in science programs such as SECME; I was part of the Varsity Badminton team and volunteered at the Miami Museum of Science (+500 hrs). This is when I decided I wanted to be an engineer and to do so I knew I had to go to college. I believe that earning a PhD is the one of the greatest professional and personal achievements possible. The fact that I would be able to contribute new findings to better the world is priceless. I can only wish to someday mentor a younger student and be able to share my success story to inspire them to do the same. I truly believe that thanks to the McNair Program and my hard work and dedication that I will succeed in reaching my future goals both academically and professionally.

ABSTRACT

WATER FLOW AND DEPOSITION IN THE WAKE BEHIND CIRCULAR PATCHES OF VEGETATION

Dr. Heidi Nepf & Lijun Zong Department of Civil and Environmental Engineering Massachusetts Institute of Technology

Vegetation patches in rivers have a strong influence on the local flow structure, which changes the sediment transport. However the sediment distribution within and around the vegetation patch will change the shape and the density of the patch. In order to understand the interactions between vegetation patch, flow and sediment transport, flume experiments were conducted to investigate the flow structures and deposition patterns around circular patches of vegetation. Two patch sizes were tested (diameter of 22cm and 42cm). Velocity measurements and flow visualization showed that the wake behind the circular patch is very different from the classical wake behind the solid circular cylinder. The flow through a vegetation patch formed a stabilized region in the wake, where the velocity and turbulence remained low and the deposition was enhanced. At two sides of the patch, the flow rate increased due to the flow diverting, and low deposition was observed. The deposition pattern suggests that, for the circular patch, the patch will grow longer in the flow direction but not grow wider.

Water Flow and Deposition in the Wake Behind Circular Patches of Vegetation

Marina I. Acevedo
Faculty Mentor: Dr. Heidi Nepf
Direct Supervisor: Lijun Zong
Florida International University, Massachusetts Institute of Technology

Introduction

- Aquatic vegetation is important for:
  - providing habitat
  - remove heavy metals and organic matter
  - preventing erosion (Fig. 1)

- Vegetation can be modeled as several cylinder in a "patch"

- All bodies in a flow have a wake (e.g. cylinder, Fig. 2)

- The wake is formed by flow structures (e.g. Divergent Flow)

- Flow structures affect sediment transport

- Sediment transport affects patch dimensions

- Patch dimensions affect flow structures

Figure 1. Vegetation Patches [1]

Flow Direction ⟹

Figure 2. Wake behind a cylinder [2]

This study focuses on how circular patches of vegetation affects the water flow in rivers. Flow structures and deposition patterns are analyzed to further understand the wake of the patches and the over all growth of the vegetation (Fig. 3).

Figure 3. Lab Set-up

Methods

Flume :
- Re-circulating flow
- 16 m long
- Testing Section: 1.2 m X 13 m (Fig. 4)

Flow:
- Velocity: 98 ± 1 mm/s
- Water Depth: 136 ± 2 mm

Vegetation:
- Wooden Dowels d= 5 mm l= 140 mm
- Perforated PVC Baseboards: 1.2m X 0.6 m
- See Table 1
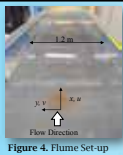
Figure 4. Flume Set-up

Patch	D (cm)	Φ	S (cm)
A1	42	100%	0
A2	42	2.2%	3.6
B1	22	100%	0
B2	22	2.2%	3.5
B3	22	10%	1.3

Table 1. Patch Dimensions
D = patch diameter,
Φ = solid volume fraction
S = average spacing between neighboring dowels
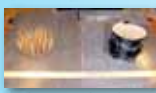
Figure 5. Sample Patches
(Left: B2; Right: B1)

Nortek Vectrino ADV:
- Sampling Rate: 25 Hz at mid depth (4 min.)
- Seeding Material: glass spheres

Dye Visualization:
- Camera (five seconds shutter time)
- Image Processing (Picasa 3.2)
- Syringe (600 mL) and needles (Fig. 6)

Figure 6. Dye Visualization Set-up

Deposition:
- Microscope slides: 2.5 cm x 2.5 cm
- Four hours undisturbed flow: 98 ± 1 mm/s
- Air-dry for two days
- Oven-dry for four hours
- Record results by weight difference

Results

Velocities

a

b

Figure 7.
Longitudinal Profile of Stream-wise Velocity, u, of
(a) A1 and A2 D = 42 cm
(b) B1 and B2 D= 22 cm
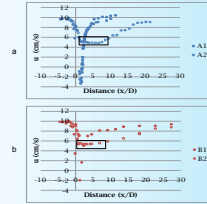
Fig. 7 Depicts the extended region of low velocity which differentiates a sparse patch from a solid patch.

Stable Wake

Figure 8. Dye Visualization
Left to Right: B1 (Φ = 100%); B3 (Φ = 10%); B2 (Φ =2.7%)

Figure 9. Turbulence level, v_{rms},
Longitudinal Profile for B1 and B2
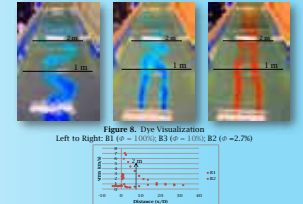
Fig. 8 Illustrates the stable wake and how it extends downstream as Φ decreases. Fig. 9 shows the turbulence begins to increase for B2 where the lateral mixing beings

Vegetation Patch Growth

a

b

c
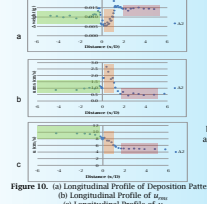
Figure 10. (a) Longitudinal Profile of Deposition Pattern
(b) Longitudinal Profile of u_{rms}
(c) Longitudinal Profile of u

Symbols
- Upstream
- In Patch
- Wake
- D= 22 cm
- D= 42 cm
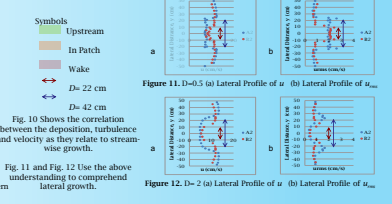
Fig. 10 Shows the correlation between the deposition, turbulence and velocity as they relate to stream-wise growth.

Fig. 11 and Fig. 12 Use the above understanding to comprehend lateral growth.

a   b
Figure 11. D=0.5 (a) Lateral Profile of u (b) Lateral Profile of u_{rms}

a   b
Figure 12. D= 2 (a) Lateral Profile of u (b) Lateral Profile of u_{rms}

Conclusion

Solid volume fraction was shown to be a major contributor in the longitudinal growth of circular patches due to the elongated stable wake region which allowed for increase deposition along the wake. The patches were also shown to be limited by the velocity of the divergent flow due to patches dimensions; the larger the patch, the lower the possibility for deposition and future growth in the lateral direction.

Acknowledgments

References

1) Google Images. "Bora9" 2009. http://www.eclipsetours.com/tahitifly2.html
2) Van Dyke, M. An Album of Fluid Motion, The Parabolic Press, Stanford, 1982.

OBJECTIVE

To understand the interactions between vegetation patches water flow and sediment transport.

Zenith Acosta

I was born and raised in Barranquilla Colombia. I moved with my family to the United States almost 7 years ago. I obtained my Bachelors of Science in Biomedical Engineering in the summer of 2010. I love medicine, science and everything related to it. That is why I decided to pursue a career in Biomedical Engineering. I want to be part of an era where medicine and technology work together for the benefit of the patient. In spring 2008 I started working at Dr. Tsoukias' lab in the Biomedical Engineering department. In the fall of that year I got accepted into the MBRS RISE program and that permitted me to continue working in Dr. Tsoukias' lab. In the summer of 2009 I got accepted as a fellow in the REU program at Harvard University. There, I was able to work in Dr. David Mooney's lab which is one of the most important labs in the area of tissue engineering. This year I became a McNair fellow and helped me increase my interest for research. These experiences helped me realize that research was a career option for me and opened up doors that I did not know they existed. In the future, I would like to pursue a PhD in biomedical engineering.

Besides doing research I love to spend time with my family and friends, read, dance, watching a good movie and swimming.

VASCULAR REACTIVITY STUDIES INVOLVING THE ACTIVATION OF NITRIC OXIDE SYNTHESIS BY AGMATINE IN RAT MESENTERIC ARTERIOLES

Vascular tone is regulated by the endothelium by releasing a variety of relaxing factors named endothelium-derived relaxing factors (EDRF). Nitric oxide (NO) falls under this category and is considered an EDRF. NO produced by the endothelial cells that line the interior of blood vessels is enzymatically synthesized by the endothelial nitric oxide synthase (eNOS). It has been demonstrated that NO is a product of NOS-catalyzed oxidation of L-arginine, and this demonstration has increased the interest in the actions of L-arginine. Despite excess levels of intracellular L-arginine, exogenous L-arginine still activates cellular synthesis of nitric oxide (NO) in a phenomenon called "arginine paradox." Our previously published data (PNAS, 104, 9982, 2007) show that L-arginine or agmatine may be initiating the NO synthesis via receptor binding and release of intracellular $Ca+2$ in endothelial cells. We hypothesize that exogenous decarboxylated arginine could act as a ligand to receptors such as imidazoline and α-2 adrenoreceptors and therefore activating the production of intracellular NO. In order to perform this study, individual 2nd order mesenteric arteriolar sections from rats (250-300 g male, Sprague-Dawley) were isolated and cannulated at both ends in a vessel chamber. The segments were contiuously perfused intraluminally and pre-constricted with norepinephirne (2 μM) in modified Krebs buffer at 37°C. The vessel chamber was mounted on the stage of a microscope fitted with a video camera leading to video caliper. Mounted vessels were allowed to stabilize for 60 min before initiating experiment. The data show that agmatine completely relaxed the vessel (n=10) and this relaxation could be significantly inhibited with nitric oxide synthase inhibitor L-NAME (0.5 Mm) (n=4), a selective a-2 receptor blocker RX821002 (50nm) (n=4), as well as with pertussis toxin a G-protein blocker (10nM) (n=2). It can be concluded that argmatine dose-dependently relaxed the rat mesenteric artery.

ABSTRACT

Vascular reactivity studies involving the activation of Nitric Oxide synthesis by Agmatine in rat mesenteric arterioles

Zenith Acosta[1], Tushar Gadkari[1], Nikolaos Tsoukias[1] and Mahesh S. Joshi[1]
[1]Department of Biomedical Engineering, Florida International University, Miami, FL

ABSTRACT

Vascular tone is regulated by the endothelium by releasing a variety of relaxing factors named endothelium-derived relaxing factors (EDRF). Nitric oxide (NO) falls under this category and is considered an EDRF. NO produced by the endothelial cells that line the interior of blood vessels is enzymatically synthesized by the endothelial nitric oxide synthase (eNOS). It has been demonstrated that NO is a product of NOS-catalyzed oxidation of L-arginine, and this demonstration has increased the interest in the actions of L-arginine. Despite excess levels of intracellular L-arginine, exogenous L-arginine still activates cellular synthesis of nitric oxide (NO) in a phenomenon called "arginine paradox". Our previously published data (PNAS, 104, 9982, 2007) show that L-arginine or agmatine may be initiating the NO synthesis via receptor binding and release of intracellular Ca^{+2} in endothelial cells. We hypothesize that exogenous decarboxylated arginine could act as a ligand to receptors such as imidazoline and α-2 adrenoreceptors and therefore activating the production of intracellular NO. In order to perform this study, individual 2nd order mesenteric arteriolar sections from rats (250-300 g male, Sprague-Dawley) were isolated and cannulated at both ends in a vessel chamber. The segments were continuously perfused intraluminally and pre-constricted with norepinephrine (2 µM) in modified Krebs buffer at 37°C. The vessel chamber was mounted on the stage of a microscope fitted with a video camera leading to video caliper. Mounted vessels were allowed to stabilize for 60 min before initiating experiment. The data show that agmatine completely relaxed the vessel (n=10) and this relaxation could be significantly inhibited with nitric oxide synthase inhibitor L-NAME (0.5 mM) (n=4), a selective a-2 receptor blocker RX821002 (50 nm) (n=4), as well as with pertussis toxin a G-protein blocker (10nM) (n=2). It can be concluded that agmatine dose-dependently relaxed the rat mesenteric artery.

INTRODUCTION

• Nitric Oxide (NO) is an important signaling molecule in the body of mammals
• NO plays significant roles in vascular biology and pathophysiology
• Small diatomic moleculeCan diffuse freely: can act in a paracrine and autocrine fashion NO is biosynthesized by Nitric Oxide Synthase (NOS) that catalyzes the oxidation of L-Arginine to Citrulline
• Three isoforms: -2 constitutive (eNOS, nNOS) - Ca+2 dependent
  -1 inducible (iNOS) - Ca+2 independent
• NO is an EDRF because in the endothelium, NO is enzymatically synthesized by the endothelial nitric oxide synthase (eNOS), and the NO produced diffuses to the smooth muscle cells resulting in vasodilation
• Arginine is involved in multiple physiological processes involving the synthesis of proteins, urea, polyamines, agmatine and NO. The conclusions about the involvement of oxidized L-arginine in the production of NO through the NOS-catalyzed reaction has incremented the interest in L-arginine and the L-arginine paradox.
• The need of exogenous arginine for the cellular NO production is called the "arginine paradox."
• agmatine is the decarboxylated form of arginine
• Structurally arginine has the guanidinium group and therefore has a similarity to the structures of ligands of imidazoline and α-2 adrenoreceptors

Figure 1: Structure of L-arginine and Agmatine, both displaying Guanidinium group similar to Imidazolines known to act as ligands for I-receptors and a-2 receptors PNAS, 104, 9982, 2007

HYPOTHESIS

The central hypothesis of this proposal is that exogenous decarboxylated arginine could act as a ligand to receptors such as imidazoline and α-2 adrenoreceptors and therefore activating the production of intracellular NO.

METHODOLOGY
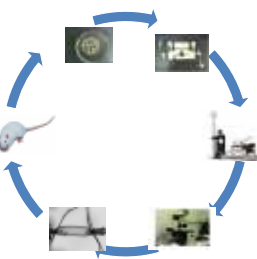
RESULTS AND CONCLUSION

Dose Response Studies
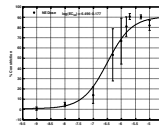
Figure 2 Norepinephrine Dose Response curve, n=3
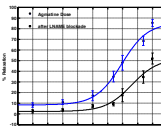
Figure 3: Agmatine Dose Response curve with LNAME blockade, n=4
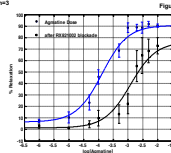
Figure 4: Agmatine Dose Response curve with RX821002 blockade, n=4
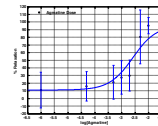
Figure 5: Agmatine Dose Response curve, n=4

Figure 6: Agmatine Dose Response curve after ptx blockade, n=4

• The data showed that agmatine completely relaxed the vessel (n=10) and this relaxation could be significantly inhibited with nitric oxide synthase inhibitor L-NAME (0.5 mM) (n=4) Figure 4, a selective a -2 receptor blocker RX821002 (50 nm) (n=4) Figure 5, as well as with ptx a G-protein blocker (10nM) (n=2) Figure 6.
In this study we were able to observe a dose dependant relaxation of the rat mesenteric mesenteric artery to agmatine. The relaxation is expected to be NO dependant as inhibition of eNOS based on the results of the blockade with L-NAME.
The Agmatine mediated relaxation might be happening via ligand binding on a-2 receptor as blockade with RX821002 shows. Blockade with ptx shows a decrease in the relaxation of the vessel. This might be happening by blocking the a-2 receptor through the inhibition of G-proteins.

FUTURE WORK

This is an ongoing study where more data involving ptx blockade as well as studies involving the role of the second messenger pathway need to be conducted.

ACKNOWLEDGMENTS

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OBJECTIVE

That exogenous decarboxylated arginine could act as a ligand to receptors such as imidazoline and α-2 adreno receptors and therefore activating the production of intracellular NO.

Paula Andrea Alzate

Paula Andrea Alzate is a senior at Florida International University graduating with a Bachelor of Arts degree in Psychology in April 2011. She is a South Florida native whose family is originally from Medellin, Columbia. She has been involved with several organization here at FIU including Psi Chi, the International Honor Society in Psychology and Alternative Breaks, a program that allows college students to learn about issues and engage in community service aimed at solving these problems. During the summer of 2010, Paula worked alongside Dr. Lorraine E. Bahrick, Director of the Infant Development Research Center at FIU and focused her research on how Intersensory redundancy can "scaffold" or educate 2-month-old infants be "educated" or directed to tempo, an amodal property, during a unimodal visual habituation if they received prior exposure to the property (bimodal synchronous audiovisual familiarization vs. bimodal asynchronous audiovisual familiarization). What got me interested in this research is that I have always been fascinated by the way in which infants develop and learn so quickly in such short periods of time. I was thrilled when I was given the opportunity to observe firsthand how research is done to uncover their hidden talents. I really enjoy watching movies, spending time with my family and boyfriend, trying new foods and traveling. My favorite foods are pizza and sushi.

INTERSENSORY REDUNDANCY EDUCATES 2-MONTH-OLD INFANTS' ATTENTION TO THE AMODAL PROPERTY OF TEMPO

ABSTRACT

The following set of experiments investigated whether exposure to the amodal property of tempo in synchronous bimodal audiovisual stimulation, which is available in the natural environment, could educate infants' attention to tempo in a more difficult context, such as unimodal visual stimulation. Two-month-old human infants were exposed to a toy hammer tapping on a surface under two experimental conditions (synchronous bimodal audiovisual, unimodal visual) and one control condition (asynchronous bimodal audiovisual). The experimental groups received 4-15 second trials of either 1) synchronous bimodal audiovisual pre-exposure (video synchronized with it's own soundtrack) or 2) unimodal visual pre-exposure (silent video) to the temporal features of a hammer tapping a specific rhythm on a hard surface, each followed by unimodal visual infant-controlled habituation to the same rhythm. The control group received 4-15 second trials of pre-exposure to asynchronous bimodal audiovisual stimulation (video with a temporally misaligned soundtrack), which was then followed by unimodal visual infant-controlled habituation. All experimental and control groups received 2 infant-controlled unimodal visual test trials depicting a toy hammer tapping the same rhythm during habituation, with a different temporal pattern. Our results suggest that 2-month-old infants were able to discriminate a change in tempo in the unimodal visual habituation session following synchronous bimodal audiovisual but not unimodal visual or asynchronous bimodal audiovisual pre-exposure to the amodal property of tempo.

Intersensory Redundancy Educates 2-Month-Old Infants' Attention to the Amodal Property of Tempo

Paula Alzate, Irina Castellanos & Lorraine E. Bahrick
Florida International University

Introduction

Infants are known to have limited attentional resources therefore the most salient properties of an event are processed first (become "foreground") while other aspects of the event (become "background") and are processed later. According to Bahrick and Lickliter (2000, 2002, 2004) and the Intersensory Redundancy Hypothesis (IRH), detection of amodal properties (e.g., tempo, prosody) is facilitated by the presentation of information in synchrony across two senses. Previous studies using animal models have shown that pre-exposure to bimodal synchronous stimulation subsequently led to attention to amodal properties in unimodal stimulation (Lickliter, Bahrick & Markham, 2006). This finding suggests that redundant audiovisual stimulation can guide the detection of amodal properties and subsequently "educate" attention to those same properties in unimodal stimulation.

The current set of experiments aimed to answer whether 2-month-old human infants could discriminate a change in the amodal property of tempo (toy hammer tapping on a surface) presented in a unimodal visual context depending on whether they were previously familiarized to the tempo in either a synchronous bimodal audiovisual, unimodal visual, or asynchronous bimodal audiovisual context. It was predicted that infants would be able to detect a change in tempo in a unimodal context only when familiarized or "educated" to the tempo in a synchronous bimodal audiovisual context.

Methods

Stimulus events. The stimulus events consisted of a video depicting a bright red colored toy hammer tapping one of two irregular 4-beat rhythms at one of two given tempos (Slow: 159 beats per minute vs. Fast: 240 beats per minute) on a wooden surface. Rhythm and tempo were fully counterbalanced across conditions. Infants in the synchronous bimodal audiovisual condition could see and hear the toy hammer tapping in synchrony, infants in the unimodal visual condition could only see the toy hammer and infants in the asynchronous bimodal audiovisual condition could see and hear the toy hammer tapping out of temporal synchrony.

Procedure: Twenty-nine 2-month-old Infants were familiarized to four 15-seconds trials of a toy hammer tapping at one of two different rhythms (Rhythm A vs. Rhythm B) in one of two different tempos (Fast vs. Slow) in one of three conditions: synchronous bimodal audiovisual, unimodal visual, or asynchronous bimodal audiovisual.

Following the familiarization phase, all of the infants participated in a unimodal visual infant controlled habituation phase where they viewed the toy hammer tapping silently at the same rhythm they received during habituation. Following habituation, infants received two test trials depicting the red toy hammer tapping in novel tempo (e.g., if the infant was pre-exposed and habituated to the toy hammer tapping the fast tempo, rhythm A then they were tested with the slow tempo, rhythm A).

Results

Infants' mean visual recovery (difference between the mean number of seconds the infant spent looking at the two test trials and mean number of seconds the infants spent looking at the two no-change post-habituation trials) to the novel tempo served as our index of discrimination. Results revealed a main effect of pre-exposure condition, $F_{(2,26)} = 6.913$, $p = .004$, indicating that infants in the synchronous bimodal audiovisual pre-exposure condition demonstrated greater visual recovery to the change in tempo than infants in the unimodal visual and asynchronous bimodal audiovisual pre-exposure condition. Additionally, infants in the synchronous bimodal audiovisual pre-exposure condition ($M = 9.39$, $SD = 10.15$) demonstrated significant visual recovery to a change in tempo, $t(11) = 3.195$, $p = .009$. In contrast, infants in the unimodal visual ($M = 0.93$, $SD = 4.61$) and asynchronous bimodal audiovisual pre-exposure conditions ($M = -4.11$, $SD = 5.05$) did not demonstrate significant visual recovery to the change in tempo, $t(11) = .695$, $p = .50$; $t(4) = -1.822$, $p = .14$, respectively. Furthermore, planned comparisons revealed that the performance of infants who received unimodal visual pre-exposure did not differ from that of infants in the asynchronous bimodal audiovisual pre-exposure ($p = .22$).

Figure 1:
Infants' (N = 29) mean visual recovery *(and SD)* to a novel tempo during the unimodal visual habituation session as a function of pre-exposure condition (synchronous bimodal audiovisual, unimodal visual, asynchronous bimodal audiovisual).
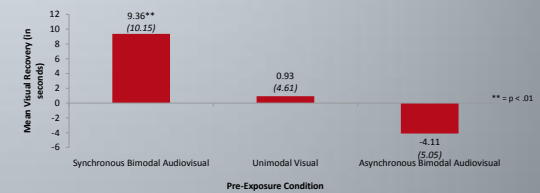
*Data collection is still in progress; results are not final

Conclusions

These results support the hypothesis that detection of amodal properties such as tempo in synchronous bimodal audiovisual stimulation can scaffold or "educate" selective attention to the same stimulus properties in subsequent unimodal stimulation. In addition, these results converge with animal based findings (Lickliter et al., 2006), where quail embryos were able to learn the temporal properties of a maternal quail call following synchronous bimodal audiovisual pre-exposure but not following unimodal auditory or asynchronous bimodal audiovisual pre-exposure. Taken together, our findings suggest that during early development, sensitivity to amodal properties (such as tempo) emerges in the context of synchronous bimodal stimulation and is later extended to unimodal stimulation.

Acknowledgements

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OBJECTIVE

Determine whether exposure to the amodal property of tempo in synchronous bimodal audiovisual stimulation could educate infants' attention to tempo.

Michele Bechor

Michele Bechor was born and raised in South Florida. A Psychology major with a double minor in Biology and Chemistry, she plans to graduate in Spring 2011. As a first-generation American of Middle Eastern decent, she hopes to earn a Ph.D. in Clinical Health Psychology with a concentration in Mind-Body Medicine. She hopes to become an expert on psychophysiological disorders, administering clinical stress management interventions that help alleviate medical symptoms. After earning a PhD, she hopes to conduct more clinical interventions with placebo research and psychoneuroimmunology and intends to become a tenured professor in a medical school, outlining to future doctors the symptoms and treatment for mindfulness-based ailments. Regarding her efforts to pursue a Ph.D., she has spent much of her time at FIU devoted to empirical research. She has been a Research Assistant in FIU's Developmental Psychobiology Lab since January 2009 and is currently conducting her senior honors thesis project, focusing on the effects of varying amounts of enriching environments on spatial exploration levels in Bobwhite quail hatchlings. She also intends to present her research at the International Society for Developmental Psychobiology Research Conference in November 2010. Michele spent her summer conducting Spatial Cognition research at the University of Notre Dame. A proud member of the Honors College, Golden Key International Honors Society and Psi Chi, Michele engages in various on-campus service and leadership activities, currently serving as a Student Ambassador for FIU's Student Alumni Association. In her spare time, she enjoys shopping, traveling and Miami Heat basketball.

DEFINING SALIENCE FOR LANDMARK SELECTION IN A NOVEL ENVIRONMENT

ABSTRACT

Learning a novel environment involves representing the objects in that environment and their locations. Typically, the objects that stand out or are the most salient are more likely to be included in later descriptions and drawings of the environment. Landmarks can be salient based on their spatial features, for example, if they are located at an intersection on a path or at a turn. Landmarks can also be salient based on their perceptual features, for example, if they are uniquely colored. The current experiment investigated the influence of spatial and perceptual features on the selection of landmarks. Subjects watched a movie of a simulated path through a 3D virtual environment with 14 intersections and 9 turns. Four landmarks were located at the corners of each intersection, with one of the landmarks uniquely colored. After viewing the video 10 times to ensure learning, subjects described the path through the environment and drew a map, in counterbalanced order. Each landmark that was included in the descriptions or maps was coded for its location at the intersection, based on its position within the map and its position relative to the path, whether its intersection included a turn and whether it was uniquely colored. Generally, participants preferred to include landmarks located farther into the environment, at locations at the far corners of an intersection and at intersections that included a turn. They included uniquely colored landmarks less often than expected by chance, and when they were mentioned, they were not associated with the object's spatial features. These data suggest that spatial features predominantly define the selection of landmarks.

Defining Salience for Landmark Selection in a Novel Environment

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Department of Psychology
University of Notre Dame

Abstract

The current experiment investigated the influence of spatial and perceptual features on the selection of landmarks. Subjects watched a movie of a simulated path through a 3D virtual environment with 14 intersections and 9 turns. Four landmarks were located at the corners of each intersection, with one of the landmarks uniquely colored. After viewing the video 10 times to ensure learning, subjects described the path through the environment and drew a map, in counterbalanced order. Each landmark that was included in the descriptions or maps was coded for its location at the intersection, based on its position within the map and its position relative to the path; whether its intersection included a turn; and whether it was uniquely colored. Generally, participants preferred to include landmarks located farther into the environment, at locations at the far corners of an intersection and at intersections that included a turn. They included uniquely colored landmarks less often than expected by chance, and when they were mentioned, they were not associated with the object's spatial features. These data suggest that spatial features predominantly define the selection of landmarks.

Introduction

Landmarks are parts of an environment which serve as anchors on the route between a given origin and a desired destination (Klippel & Winter, 2005). Landmarks are characterized by their singularity to their environment (Winter, Raubal & Nothegger, 2005) and mark positions on a path (Nothegger, Winter & Raubal, 2004). However, it is not practical to select all landmarks in navigation (Winter, Raubal & Nothegger, 2005). Landmark selection is influenced by salience, the prominence of an object relative to its environment (Nothegger, Winter & Raubal, 2004). Two subtypes of salience are spatial salience, based on the distance between a landmark and the desired path (Klippel & Winter, 2005), and perceptual salience, its prominence due to visual characteristics (Carlson & Hill, 2008). One form of spatial salience is decision-point salience, referring to a landmark at a point on the path at which a change in direction can occur, such as an intersection (Lovelace & Hegarty, 1999). Color is an important component of perceptual salience.

The "Kissing Bridge" at MMC **"The Cube" at MMC**

SPATIAL SALIENCE **PERCEPTUAL SALIENCE**

Previous Work

One study on landmark selection in a multiple-landmark, multiple-decision point environment (seen on the left) found spatial features predominantly influenced landmark selection in a spatial task; subjects chose landmarks at turns more often (Swearingen, 2010).

Another study which placed perceptual and spatial salience in competition found perceptually salient objects were encoded more often but failed to influence landmark selection in spatial tasks (Miller & Carlson, in press).

The Current Study

The purpose of the current study was to determine whether at an intersection with a perceptually salient object, will subjects choose landmarks based on spatial salience or based on perceptual salience. To test this question in our environment, the perceptually salient object occurred at the different positions at different intersections (seen below).

Our 2 key predictions were: (1) spatial salience would guide landmark selection (landmarks further into the environment would be chosen) and (2) perceptual salience would aid in memory but NOT in spatial placement.

Procedure

Forty-one undergraduate students from the University of Notre Dame viewed a first-person video of a route through an environment. Nine of the 14 intersections involved either a left or right turn. After viewing one video 10 times to ensure learning, we asked each participant to perform 3 tasks.

For the first task, subjects were asked to either provide directions or describe the video environment (right).

For the second task, subjects were asked to draw a freehand map (example on left) of the environment, including the pictures of the landmarks in their proper locations when possible.

Procedure (Continued)

For the third task, we provided the subjects with a blank map of the environment layout and a list of the pictures on each environment landmark. We then asked each subject to draw the route they took, placing landmarks as they were in the environment whenever possible (example, right).

Coding

Each landmark per intersection was assigned number 1-4 based on either the absolute (fixed) or ego (relative) frame of reference. Numbering began in the upper left and continued in the clockwise direction.

In the absolute reference frame (shown above), landmarks 1 and 2 were consistently further into the environment while 3 and 4 were closer to the viewer. Relative frames of reference were dictated by the motion of the traveler. Ego-in coding referred to the positions as the traveler entered the section. Ego-out coding described them as the traveler left the intersection.

We coded each landmark included in each subject's map, description and memory task based on whether the subject reported a turn, whether the landmark was colored and based on position.

Results

Subjects were more likely to include landmarks at turning points in the map drawing task.

Results (Continued)

Subjects were significantly more likely to include colored landmarks in the memory task only.
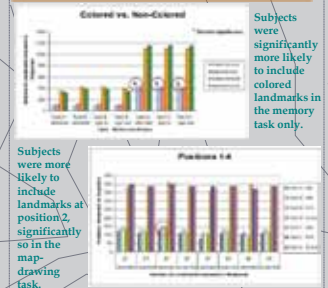
Subjects were more likely to include landmarks at position 2, significantly so in the map-drawing task.

Discussion

Effects of spatial salience (turning and position) were shown in the map-drawing and description tasks (spatial tasks). This supports Swearingen (2010). Also, perceptual salience only influenced landmark selection in the memory task (a perceptual task). This supports Miller & Carlson (in press). High accuracy between included objects and their environmental colors (71%) indicate subjects remembered the colored landmarks well, but did not include them in responses when they were not navigationally relevant.

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OBJECTIVE

To determine whether at an intersection with a perceptually salient object, will subjects choose landmarks based on spatial salience or based on perceptual salience.

Christian Bueno

I was born in Lima, Peru on April 6, 2009. At about the age of two my family and I immigrated to the United States of America and have been here ever since. During middle school and high school I had practiced Tae Kwon Do (attaining the level of black belt) and for the first two years of high school I had also wrestled for my high school. I had to stop both after a knee injury that prevented me from seriously practicing the sports ever since. At age 16 I entered into the College Academy program at Broward College. This was a collegiate high school, meaning that I went to school at the college and accumulated college credit primarily while finishing up my remaining high school credits. I was in the program for my junior and senior years of high school or equivalently, my freshman and sophomore years of college. In 2007 I graduated from Broward College with my Associates Degree and shortly after graduated from the College Academy with my high school diploma. It was at the College Academy that I first began nurturing my interest in physics. In the Fall of 2007 I began my studies at Florida International University and chose Physics as my major. A few short years later, I had also picked up a major in mathematics. Finally in 2010 I became a McNair fellow and now plan on pursuing graduate studies in mathematics after I graduate.

A GROUP THEORETIC PERSPECTIVE ON PEBBLE MOTION PROBLEMS

Christian Bueno and Miroslav Yotov

ABSTRACT

We take a strong algebraic perspective on the general permutation pebble problems. In particular we assign to each game its natural group based on how the pebbles are allowed to permute by the pebble moves. We call this group the home group. We go on to show that this group is an invariant of the game. We go on to prove that the numbers of conjugates of the home group are less than the number of components in the configuration graph.

A Group Theoretic Perspective on Pebble Motion Problems

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Introduction

The topic of this study deals with the connection between group theory and class of problems known as *Permutation Pebble Motion Problems* (PPM), and how this connection may be exploited. A graph G can be though of as a set of *vertices* combined with a set of relationships that connect them called *edges*. They can be easily and naturally visualized like these examples:

Vertex

Edge

Lets add another layer of complexity. If we consider a graph G and additionally a set P of "pebbles" which are to be placed on distinct vertices of G, we may play a little game in which pebbles are allowed to move from vertex to vertex based on some simple rules (like a game board). The rule is as follows: If a pebble is connected by an edge (*adjacent*) to an unoccupied vertex, then it may move there. If all pebbles are considered distinct and we ask questions about whether one configurations of pebbles can be transformed into another through a sequence of legal moves (plans), then we are discussing a permutation pebble motion problem (PPM). Here are some illustrations:
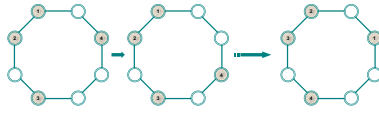
Lastly, a *group* is a set of elements (in this case operations) equipped with a binary operation such that any two elements can be, in a sense, multiplied or composed. This binary operation is associative, the group contains an identity operation, and each operation has an inverse operation.

What we do in this study is assign to each of these games a group that encodes which rearrangements are allowed, and then study these group objects and their various properties. This allows us to somewhat reduce a problem in algorithmic graph theory to one of group theory.

Home Group

Select a starting configuration k and the vertices on which its pebbles lie. These pebbles will call these vertices their *home*. After using a sequence of moves, some or all of the pebbles will have left their home and began exploring the rest of the graph, after which the eventually come back home (if they don't want to, we make them). Depending on which sequence of moves we chose, they may have returned home in a different configuration, i.e. a different permutation. The set of all permutations that can happen this way form the *home group*. For a graph G with p pebbles and initial configuration k, we can create the home group $H(G,p,k)$. [It is important to note that these are permutations on the pieces relative to the initial configuration]. The examples below show what is meant:

(23) (132) (23)

e (231) (132)

e*(23)=(23) (231)*(132)=e (132)*(23)=(13)
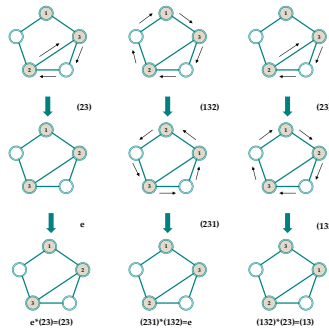
In the image above we exemplify the permutation composition, identity and inverses.

The first result worth proving about the home group is that if there exist a sequence of moves that can turn one configuration into another, then their respective home groups are identical.

The first result worth proving is that if there exist a sequence of moves that can turn one configuration into another, then their respective home groups are identical.

Lemma 1. *If two configurations k and k' are connected by a sequence of moves, then $H(G,p,k)=H(G,p,k')$.*

(Sketch of Proof) If the set of allowable permutations for k is known, then we may use them to construct the permutations of k'. What we do is consider a sequence of moves f that turn k' into k and any permutation ϕ from $H(G,p,k)$. By transforming k into k' we can then additionally permute the pebbles according to ϕ and then using the inverted sequence of moves f^{-1} to bring the pebbles back to the home induced by k. This means that $H(G,p,k)$ contains our arbitrary permutation ϕ, and thus all elements of $H(G,p,k')$. Thus $H(G,p,k)$ is a subset of $H(G,p,k')$. Reversing the argument we get $H(G,p,k')$ is a subset of $H(G,p,k)$ and therefore $H(G,p,k)=H(G,p,k')$.

Another useful property is that if two configurations k and k' are rearrangements of each other such that they share the same underlying vertex set (same home) then their respective home groups are conjugate.

Lemma 2. *If two configurations k and k' are permutations of each other, then their home groups are conjugate in the symmetric group of p elements.*

(Sketch of Proof). If there was space to more carefully examine the definition of the home group, the result would fall out naturally.

With these two properties combined, we may form a powerful statement about the home group: The home group is an invariant of the pebble game on G with p pebbles.

Theorem 3. *If k and k' are configurations for the game on G with p pebbles, then $H(G,p,k)$ is isomorphic to $H(G,p,k')$. More specifically $H(G,p,k)$ and $H(G,p,k')$ are conjugates.*

(Sketch of Proof). It is best to do this theorem by cases:

Case 1. If k and k' are connected by a sequence of moves, then by lemma 1 it follows that the two home groups are equal, and thus trivially conjugate.

Case 2. If they are not connected by a sequence of moves, then some permutation k'' of k' is connected to k. To prove this we invoke the spanning tree theorem and algorithmically move k to k'' without a problem. The home groups $H(G,p,k)=H(G,p,k'')$ and $H(G,p,k'')$ is conjugate to $H(G,p,k')$ and thus $H(G,p,k)$ is conjugate to $H(G,p,k')$.

Theorem 4. *The number of conjugates of $H(G,p,k)$ is less than or equal to the number of components of the graph of configurations.*

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OBJECTIVE

The connection between group theory and class of problems known as Permutation Pebble Motion Problems (PPM), and how this connection may be exploited.

Natalie Damaso

Natalie Damaso is currently a senior at Florida International University pursuing a Biology bachelor degree in Biology with a minor in Chemistry. She is involved with many student activities, such as being the President of the National Student Exchange Club. During the academic year of 2008-2009, she participated in the National Student Exchange Program in which she attended Plymouth State University in Plymouth, New Hampshire. During her exchange she participated in genetic research working with pseudo-nitzchia. During the summer of 2010, with the help of the McNair program, she was able to partake in biochemistry research in John Berry's lab at Biscayne Bay campus working with Inhibition of Phosphatase2A by Microcystin LR within skin and liver cancer cells. Currently she is working to achieve her academic goal, which is to obtain a Ph-D in genetics or a related field. Natalie really enjoys watching movies, socializing, reading, and playing sports. Her favorite food is lasagna. Her academic goal is to obtain a Ph.D. degree in genetics or a related field. During this process she hope to learn as much as possible in the areas of performing research and how to achieve success in a laboratory environment. Her career goals are to work in an area of cutting edge research and to make what she have learned useful in society so that others can live healthier more successful lives. My career goals are heavily dependent on my academic goal to obtain a Ph.D. degree. The McNair program offers me the unique opportunity to be a part of many research topics and open new doors for me during my academic career.

INHIBITION OF PROTEIN PHOSPHATES BY MICROCYSTIN- LR IN LIVER AND SKIN CANCER CELLS

ABSTRACT

Microcystins are toxic cyclic heptapeptide produced by cyanobacteria that have been reported to be a serious public health issue because of their contamination in drinking water. Microcystin-LR, one of the most common members of the microcystin family, are toxins that have been known to be tumor promoters as well as cause liver damage, gastroenteritis, and irritation by inhibiting serine/threonine protein phosphatase 1 and 2A. In the study Bouaicha et al (2002) fluorometric protocol for detecting microcystin-LR was used with modifications to study the cellular effects of microcystin in skin and liver cancer cells. Rifampicin and Ursolic Acid was also used to look at the affect of their organic anion transfer proteins which is known to be the carrier proteins for microcystin into a liver cell and blood brain barrier. We expect to see a dose dependent response between concentrations of microcystin-LR and inhibition as shown by Bouaicha simple model using a commercial enzyme (PP2A). We also expect to see the inhibitors (rifampicin and ursolic acid) to effect the uptake of microcystin into the liver cells because of the OATP(organic anion transfer proteins), which have been known to be the cell mediated transfer proteins that effect the liver cells, but also hope to see their effect on the skin cancer cells as they have never been studied before. Sodium orthovanadate was used with microcystin concentrations to help inhibit the other phosphatases, such as tyrosine and alkaline phosphatase, to be able to study the PP2A inhibition of microcystin. Results did show a dose dependent response of the concentrations of microcystin and phosphatase inhibition. The inhibitors did have an effect on the liver cancer cells, but showed the opposite effect with the skin cancer cells.

Inhibition of protein phosphatase by MC-LR in liver and skin cancer cells

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Florida International University• Miami, FL

Abstract

Microcystins are toxic cyclic heptapeptide produced by cyanobacteria that have been reported to be a serious public health issue because of their contamination in drinking water. Microcystin-LR, one of the most common members of the microcystin family, are toxins that have been known to be tumor promoters as well as cause liver damage, gastroenteritis, and irritation by inhibiting serine/threonine protein phosphatase 1 and 2A. In the study Bouaicha et al (2002) fluorometric protocol for detecting microcystin-LR was used with modifications to study the cellular effects of microcystin in skin and liver cancer cells. Rifampicin and Ursolic Acid was also used to look at the affect of their organic anion transfer proteins which is known to be the carrier proteins for microcystin into a liver cell and blood brain barrier. We expect to see a dose dependent response between concentrations of microcystin-LR and inhibition as shown by Bouaicha simple model using a commercial enzyme (PP2A). We also expect to see the inhibitors (rifampicin and ursolic acid) to effect the uptake of microcystin into the liver cells because of the OATP(organic anion transfer proteins), which have been known to be the cell mediated transfer proteins that effect the liver cells, but also hope to see their effect on the skin cancer cells as they have never been studied before. Sodium orthovanadate was used with microcystin concentrations to help inhibit the other phosphatases, such as tyrosine and alkaline phosphatase, to be able to study the PP2A inhibition of microcystin. Results did show a dose dependent response of the concentrations of microcystin and phosphatase inhibition. The inhibitors did have an effect on the liver cancer cells, but showed the opposite effect with the skin cancer cells.

Introduction

Microcystin have been declared a serious public health threat by the World Health Organization because of their potential threat to organisms from microalgae to humans. They have proposed that the lifetime safe consumption level of microcystin-LR to be 1μg/l. Microcystin-LR, are monocyclic heptapeptides cyanobacteria with two variable amino acids leucine and arginine that have been known to promote tumors as well as cause liver damage. Their basis of toxicity is by the inhibition of serine/threonine protein phosphatase, specifically PP1 and PP2A, which leads to hyperphosphorylation of cellular proteins. Protein phosphatase 2A are important in cellular functions as well as important tumor suppressor proteins.

Microcystins are not cell permeable except in liver cells; their transport is mediated through carrier mediated transport. More specifically organic anion transfer proteins (OATP) have been known to transfer microcystin-LR into hepatocytes as well as the blood brain barrier. There are inhibitors, such as Rifampicin and Ursolic Acid, which have been known to inhibit the toxic effect of microcystin by affecting the organic anion transfer proteins.

Inhibition of protein phosphatase 2A can be observed using Bouaicha's fluorometric assay protocol using the substrate 4-MUP. The percent change in fluorescence is inversely related to the inhibition of phosphatases, which is the ability to convert MUP (4-methylumbelliferyl phosphate) to MU (4-methylumbelliferone).

4-Methylumbelliferyl Phosphate → 4-Methylumbelliferone

Methodology

Fluorometric Cell Free Lysate Assay
•Lysed HepG-2 and SKMEL-5 using RIPA buffer and Halt protease inhibitors followed by freeze/thaw process
• Black 96-well plate set up using: 200ul MC-LR/H_2O, 50ul 5X Bouaicha buffer, 25ul SKMEL-5/ HepG-2 lysate, 25ul 1X MUP
• Two fold serial dilutions of microcystin-LR starting from 100ug/l, 10ug/l, and 1ug/
• Analyzed plate using KC-4 software and Synergy HT-I plate reader at excitation/emission wavelengths of 360-460nm

Fluorometric Assay using Na_3VO_4 after direct exposure of SKMEL cells to MC-LR
•Exposed SKMEL-5 cells to serial dilution conc. of MC-LR for 1 hr in incubator
• Lysed cells using RIPA buffer and Halt protease inhibitors followed by freeze/thaw process
• Transferred lysate to black 96-well plate.
• Added different concentrations of Na_3VO_4 (.1mM and 10mM)
• Analyzed plate using KC-4 software and Synergy HT-I plate reader at excitation/emission wavelengths of 360-460nm

Fluorometric Assay using high/low MC-LR conc. within cells and OATP inhibitors
•Cultured each cell line into 27 Petri dishes
• Exposed SKMEL-5 cells to Rifampicin or Ursolic Acid for 30 min followed by exposure to MC-LR and inhibitors for 1 hr
• HepG-2 cells had no previous exposure to inhibitors
• Removed MC-LR and inhibitors with sterile PBS followed by addition of RIPA/protease inhibitors to lyse the cells using liquid N_2 to snap freeze
• Black 96-well plate set up using: 200ul H_2O, 50ul 5X Bouaicha buffer, 30ul Na_3VO_4, 25ul SKMEL-5/ HepG-2 lysate, 25ul 1X MUP
• Analyzed plate using KC-4 software and Synergy HT-I plate reader at excitation/emission wavelengths of 360-460nm

BCA Protein Assay
•Prepared BSA standards: 2, 1, 0.5, 0.25, 0.125, 0 mg/ml
• Prepared working reagent by mixing: (50:1), Reagent A: Reagent B
• Clear 96 well plate set up using: 25ul lysate, 25ul of BSA standards followed by 200ul of working reagent
• Mixed plate in plate shaker, covered plate, and incubated for 30 min
• Analyzed plate using KC-4 software and Synergy HT-I plate reader at absorbance wavelength of 562nm

Results

Figure 1: Exposure of serial dilutions from 1ug/l- 0ug/l MC-LR to HepG-2 and SKMEL-5 lysates.

Figure 2: Exposure of serial dilutions from 10ug/l- 0ug/l MC-LR to HepG-2 and SKMEL-5 lysates.

Figure 3: Exposure of serial dilutions from 100ug/l- 0ug/l MC-LR to HepG-2 and SKMEL-5 lysates.

Figure 4: Direct exposure of serial dilutions from 100ug/l-0ug/l MC-LR to SKMEL-5 cells using 0.1mM Na_3VO_4

Figure 5: Direct exposure of serial dilutions from 100ug/l- 0ug/l MC-LR to SKMEL-5 cells using 0.1mM Na_3VO_4.

Figure 6a: Direct exposure of 1ug/l or 0ug/l MC-LR and inhibitors (None (PBS), Rifampicin, Ursolic acid) to SKMEL-5 cells. 0.1mM Na_3VO_4 addition.

Figure 7a: Direct exposure of 100ug/l or 0ug/l MC-LR and inhibitors (None (PBS), Rifampicin, Ursolic acid) to HepG-2 cells. 0.1mM Na_3VO_4 addition.

Figure 6&7b: BCA Protein Assay: BSA standards (2, 1, 0.5, 0.25, 0.125, and 0mg/ml) to quantify protein.

Conclusion

It has been shown previously that microcystin-LR inhibits serine/threonine phosphatase 2A dose dependently using a commercial enzyme (Bouaicha et al, 2002). In this study, his protocol was utilized to study their effect within the complex cell system. Given that the cell is a very complex system there are many other phosphatases that can be affected by the toxin. In Fig. 1-3 there is variability in protein phosphatase activity as conc. of MC-LR increases however, increased inhibition (as a trend) as conc. of MC-LR increases. Sodium orthovanadate was employed to inhibit other phosphatases that could be affecting the study, such as tyrosine and alkaline phosphatases. These figures (4-5) not only show the effect of the phosphatase inhibitor, but also the effect of direct exposure of microcystin-LR within the cells for an hour. These data did show that the optimal concentration of Na_3VO_4 addition to be 0.1mM before fluorescent substrate is added.

It has been reported that the uptake of microcystin-LR into liver cells and blood brain barrier is through cell mediated transfer proteins, specifically organic anion transfer proteins,OATPs, (Meirer-Abt et al, 2007) (Fischer et al, 2005), but there is no record of cell mediated transfer proteins within skin cells. Inhibitors such as, Rifampicin and Ursolic Acid, potentially block uptake of microcystin by affecting the OATPs in HepG-2 (liver) cells. There is a significant difference when the inhibitors were added than no inhibitors for Fig. 7a HepG-2 (liver) cells. When the inhibitors were added, the change of activity of the low concentrations of microcystin was almost equal to the high concentrations of microcystin therefore, showing that they did block the uptake of microcystin-LR into the cell therefore not affecting the inhibition of the phosphatases. However, the opposite effect occurred within the SKMEL-5 (skin) cells, Fig. 6a. The BCA protein assay was used to quantify the amount of protein in each well to get a more accurate data that takes into account the amount of activity per unit of protein. This was calculated by solving for x by inputting the y (absorbance) using the linear regression line equation established by the absorbance and BSA standards that were graphed as shown in Fig. 6 &7b.

Acknowledgements

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OBJECTIVE

Measure inhibition of protein phosphates by Microcystin- LR in liver and skin cancer cells.

Kimberly Dizon

My name is Kimberly Dizon and I am a plan to obtain a Bachelors degree in Nursing with a minor in Psychology. I also plan to pursue a Ph.D. in nursing focusing on mental-health. Intellect, modesty, sense of humor, generosity, being self-motivated and being respectful are qualities in people that I admire and qualities that I try to live up to everyday. I love understanding why people do what they do. I believe understanding one's client as best as possible will help the nurse give a proper diagnosis and in turn implement the best intervention. This is why I found it imperative to pursue both majors to get the best out of both worlds and apply it to my practice.

I ventured even further through the research experience in my undergraduate career thus far. Past research experience ranges from cognitive infant development, positive adolescent development, breast cancer and the effect on couple dynamics, breast cancer and minority group couples, and dual diagnosis. As one can see, my research interests completely integrate both of my fields of study and therefore I am open to any topics that are in line with this idea of interdisciplinary research. I am affiliated with APA, NSCS and Psi Chi (wherein I held the leadership position as chapter president for 2 years). Last but not least, I am a proud IB, MHIRT and McNair fellow.

On a personal level, I like photography/cinematography, reading, cooking and being with my loved ones. I also like to teach and compose vocal/musical arrangements using the piano, organ or guitar. I love all types of music and I appreciate the differences in everything. I'd like to believe I'm an approachable person and I genuinely love helping people. My philosophy: When you lose, don't lose the lesson.

DUAL DIAGNOSIS IN THE ADOLESCENT POPULATION: MENTAL HEALTH NURSING CONSIDERATIONS

ABSTRACT

In Erik Erikson's eight stages of psychosocial development the critical task of the adolescent (ages 12-18) is to reach a "sense of identity." To elaborate, this stage explores and clarifies to the individual a sense of "who one is" and "what one means to others." If this goal is not achieved, psycho-social problems may result (Erikson, 1968). The journey to reach this goal may incorporate social experimenting with narcotics, alcohol, risky behavior and other maladaptive practices to temporarily ease the stress felt in an adolescent's life. While there are individuals who practiced these activities and are able to exit this stage without negative psychological outcomes, there are individuals who do not and the range of psychological disorders that one may acquire is wide. The abuse of substances combined with initial or subsequent mental health problems causes significant functional and social problems during adolescence.

This growing problem facing adolescence is called Dual Diagnosis (DD) in the field of mental health. As illustrated in Figure 1, it is also known as "Co-occurring" or "Co-morbid" Disorder. DD describes the condition where individuals interdependently suffer from both a Mental Illness (MI) and a Substance use Disorder (SUD) [Department of Health, 2006]. As a nurse, one should be prepared to provide full service care to individuals who suffer from this diagnosis. Currently, the topic of DD treatment has been widely examined in general mental health literature in comparison to the available nursing literature. The purpose of this literature review article is to describe DD and its treatment issues in adolescents by: 1) identifying current barriers to successful Dual Diagnosis nursing interventions and 2) describing current evidence-based practice interventions tailored to adolescents for nurses to utilize in practice. Dual Diagnosis (DD) is the term used for individuals who interdependently suffer from both a Mental Illness (MI) and a Substance Use Disorder (SUD). Though research supports the overwhelming increase in prevalence among all age groups, the incidence is increasing particularly among the adolescent population for ages 12-18. The outcomes of DD adolescents have higher levels of depression symptoms, poorer global functioning and higher levels of substance use compared to those who have no diagnosis (Vida et al., 2009). Also, adolescents who entered SUD treatment revealed 72% of the cannabis users reporting two or more psychiatric symptoms (Diamond et al., 2006). Currently, there is a gap between general literature versus nursing literature on DD and adolescence. The purpose of this literature review is to raise nurses' awareness of DD treatment issues in adolescents by 1) identifying current barriers to successful DD nursing interventions and 2) describe current evidence-based practice interventions tailored to adolescents.

Dual Diagnosis in the Adolescent Population: Mental-Health Nursing Considerations

Kimberly Dizon, SN and Kathryn H. Anderson, PhD, ARNP || Florida International University, Miami, Florida

Dr. Ronald E. McNair Post-Baccalaureate Achievement Program || COHORT 7

Background and Significance

Dual Diagnosis (DD) is the term used for individuals who interdependently suffer from both a Mental Illness (MI) and a Substance Use Disorder [SUD] (Department of Health, 2006).

There are 3 general DD treatment models: **serial, parallel and integrated**. Health care providers agree that the best treatment must address both diagnoses at the same time which scholars refer to as an "integrated" treatment model (Schulte et al., 2008). While there is knowledge about what treatment model works, there is still no compelling evidence to support any one psychosocial intervention (Cleary et al., 2010).

Though research supports the overwhelming increase in prevalence among all age groups (Frisher et al., 2004; Trathen et al., 2007), the incidence is increasing particularly among the adolescent population for ages 12-18.

Some of the facts:
•Adolescents who entered SUD treatment revealed 72% of the cannabis users reporting two or more psychiatric symptoms (Diamond et al., 2006)
•The outcomes of DD adolescents have higher levels of depression symptoms, poorer global functioning and higher levels of substance use compared to those who have no diagnosis (Vida et al., 2009)
•Despite the known high rates of DD, 57.5% of the treatment providers surveyed offer integrated care for dually diagnosed clients (Ducharme, 2006)

Developing a nursing plan of care that sufficiently address both diagnoses increases the mental-health nurses' responsibilities. Nurses do not only treat dually-diagnosed clients in the mental-health setting, but also on regular medical/surgical settings and community settings (Edward & Munro, 2009).

From a mental-health nursing perspective, though there are evidenced-based practices available (SAMHSA, 2007) clearly defined evidenced-based practice interventions for adolescents with DD are lacking. This contributes to the reported low confidence of nurses, when it comes to treating these individuals (Coombes, L. & Wratten, A., 2007).

Currently, a gap in the DD literature gap exists in regards to nursing interventions tailored for dually-diagnosed adolescents. The purpose of this poster is to provide needed information to increase awareness of practice issues in dual diagnosis adolescents, identify current barriers to interventions and tailor current evidence-based practice interventions to adolescents.

Research Aims

To raise nurses' awareness of Dual Diagnosis treatment issues in adolescents by:
1)Identifying current barriers to successful Dual Diagnosis nursing interventions
2)Describe current evidence-based practice interventions tailored to adolescents

Method

Electronic research databases including MEDLINE, EMBASE, PsycINFO, CINAHL, Health Sciences, Nursing and psychARTICLES were used to locate topic of interest articles. Date parameters were originally set for 2005 to the present. Select articles published before 2005 are included in this review to elaborate on prior knowledge that is still currently relevant. Meta-analyses, systematic reviews, peer-reviewed articles, randomly controlled trials, and primary studies were preferred articles selected for review. Additionally, reference list searches were done. Origin of articles, for example if published other than in the United States, was also taken into account for global generalizability. Since the mental-health nursing scope of practice is the focal point, medical interventions such as pharmacological modalities were classified as exclusion criteria for this review.

Basic search terms used were: adolescence, co-occurring disorders, co-morbidity, dual diagnosis, mental-health nursing, mental health services, mental illness, nursing, outcomes, prevalence, substance use disorders and treatment. Though there was a lot of general literature available, few nursing literature was identified that addressed dual diagnosis in the adolescent population AND mental health nursing considerations. Findings were reviewed and interventions were adapted to adolescent DD care.
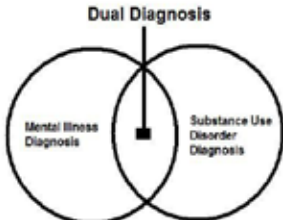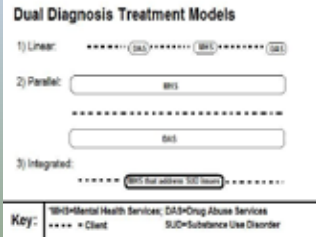
Figure A – (Department of Health, 2002)

Dual Diagnosis

Figure B – (Department of Health, 2002)

Dual Diagnosis Treatment Models

Findings

Barriers for Mental-Health Nurses in treating Adolescents with a Dual Diagnosis

- Lack of continuity of care from shift-to-shift decreases essential nurse/client relationship
- Mental-health nurses' stigma towards DD adolescents
- Attitudes of mental-health nurses of their own competency in treating DD adolescents
- Follow-up of client's status after discharge is low which increases likelihood of relapse
- Very few in-service programs available to train Mental-Health nurses

Recommendations for Mental-Health Nurses to Improve Practice

Specific DD Training should be focused on:
1) Early detection of DD by Mental-Health nurse with specific guidelines
2) Emphasizing that program steps are available for successful DD treatment
3) Current knowledge of successful Evidence-Based Practice treatment strategies.
   a) Examples: Cognitive Behavioral Therapy, Multi-System Therapy, Seeking Safety Therapy, Involving Family in Therapy
4) Properly utilizing motivational interviewing skills with clients
5) Knowledge of alcohol-use and cannabis-use cessation techniques (since these are what adolescents tend to use)
6) Knowledge to treat mental illnesses that are prevalent in this population.
   a) Examples: Depression, Anxiety, and Oppositional Behaviors

Care plans should include:
1) Educating client and family
   a) About illness dynamics, their critical pathway, severity, and consequences
   b) Local outreach treatment programs. Examples: school-based, community centers, in/out-patient facilities, group and network support
2) Identifying and encouraging client to take part in care support group
3) Ensuring a positive environment that promote treatment adherence
4) Harm reduction interventions. Example: Methadone therapy for heroine users
5) Emphasis of follow-up status after client's discharge to promote less incidence of relapse

Limitations

This literature review did not focus on one type of mental-illness or one type of drug-of-choice. Origin of articles are from different countries such as US, UK, Australia which may affect application to own specific country. Because DD is complex in treatment, many aspects of care were not described and thus could not be adequately evaluated.

Conclusions

Future research needs to explore and evaluate specifically mental-health nurse interventions. For example, studies that address the implementation and evaluation of mental-health nurses using "Matrix Model" of DD service delivery (Georgeson, 2009).

Nurses should be open to sharing their knowledge to fellow colleagues to:
1) Lessen the stigma that nurses have towards dually-diagnosed adolescents
2) Raise self-efficacy in treating dually-diagnosed adolescents

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Acknowledgments

OBJECTIVE

To raise nurses' awareness of Dual Diagnosis treatment issues in adolescents by:

1) Identifying current barriers to successful Dual Diagnosis nursing interventions

2) Describe current evidence-based practice interventions tailored to adolescents

Jason Espinoza

My name is Jason Espinosa and I am a 22 year senior majoring in mathematics. I was born in Miami, Florida and I consider myself very fortunate because I have always had a brain for math. I plan to earn my Ph.D. in Mathematics and become a professor. I have a talent and love for teaching and I will always continue to learn via research and working with colleagues and students. The McNair Fellowship proved invaluable in both developing skills I will need for graduate work and doing research. I had two years of research work in the astrophysics lab at the University of Miami and one summer I was awarded a Beyond the Book scholarship to continue my work. I believe that mathematics is the bedrock of our society. It permeates every aspect of our lives, and the research done in the subject can have effects that ripple through society for generations. From technology to every field of science to everyday life, mathematics at the most basic study of patterns, structures, and connections in our world is undeniably fundamental to understanding and improving it. My current research topic is Hyperbolic Geometry. I've always been interested in math, ever since I was 5 years old. My research topic is related to physics, which I also like a lot. My hobbies are listening to music, programming, and karate.

ABSTRACT

A PARTIAL CHARACTERIZATION OF THE EULER LINE IN THE HYPERBOLIC PLANE
This thesis is dedicated to the memory of Dr. Ronald E. McNair

Abstract. The hyperbolic geometry is obtained by replacing the famous parallel postulate of Euclidean Geometry with the Hyperbolic Parallel Postulate, and important to the history of geometry. Due to its nature, it is natural to ask whether a particular Euclidean result has an analogue in hyperbolic geometry, and this question posed for the Euler line, which connects many triangle centers. For which classes of triangles the Euler line exists is explored, and it is concluded that it exists for some all isosceles triangles and no right triangles. For which other triangles it exists is unknown.
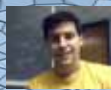
The Euler Line in Hyperbolic Geometry

Jason Espinosa

Introduction

Hyperbolic Geometry is the end of a 2000 year quest to fix Euclid's *Elements*. The *Elements* establishes geometry from axioms – statements taken for granted - and results that follow from those axioms. Its genius is that the consequences of its axioms is the geometry we are familiar with. The most controversial axiom was the parallel postulate, which states that for a point a and a line B, there is only one line A through a that's parallel to B. The hyperbolic parallel postulate states that there are infinitely many such lines. We can represent this by changing what a line looks like. In the Escher painting below, note that the white curves are parts of circles or straight lines through the center and intersect the circle at 90 degrees, and that the figures get smaller as the reach the edge. This is how the Poincare model of hyperbolic geometry is defined.
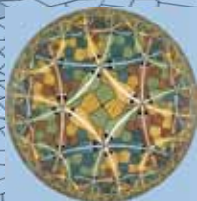
M.C. Escher. Circle Limit #3.

The **Euler Line** is an important line in Euclidean triangle geometry. It goes through 3 triangle centers. The *centroid* is the point of intersection of the lines connecting each vertex to the midpoint of the opposite side. The *orthocenter* is formed from the lines starting at a vertex and forming a right angle with the opposite side. Finally, the *circumcenter* is the center of the circle touching all three vertices of the triangle.

Results

The Euler line has been characterized for hyperbolic isosceles triangles and hyperbolic right triangles. For hyperbolic isosceles triangles, the Euler line exists. It is possible, through basic geometry, to prove that any isosceles triangle is congruent to one like in the figure to the right. The hyperbolic Euler line (the green line in the figure), which is defined slightly differently from the standard one, always exists for isosceles triangles. It does not exist for most right triangles.

Right: Isoceles triangle ⟶

Conclusion

The current results suggest thattthe isosceles triangle is the only triangle with an Euler line in the hyperbolic plane. After proving or disproving this, there are other questions to explore. Is the Euler line related to the defect (a hyperbolic property) of the triangle? Is there a relationship between the distances of the triangle centers? Given the importance of the Euler line to triangle geometry, it could prove as useful in the hyperbolic case.

Acknowledgements
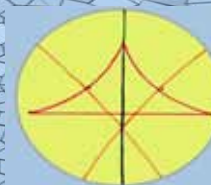
OBJECTIVE

It is natural to ask whether a particular Euclidean result has an analogue in hyperbolic geometry and this question posed for the Euler line which connects many triangle centers.

Erika Nicole Fountain

I was born in Houston, Texas and was raised in Miami, Florida. After graduating from Lourdes Academy High School, I was admitted into Florida International University and began my studies in the areas of Psychology, Sociology & Anthropology, and Criminal Justice. As a college student I took up new hobbies such as cooking and playing the guitar, and thus sparked my interest for learning new things. During my sophomore year I began a research assistantship in the Cognitive Laboratory and Workshop (C.L.A.W) under Dr. Daniel Wright where I saw first hand what psychological research was about. Conducting various studies on eyewitness memory and memory conformity nourished my interest in the research process and led me to acquire more experiences in different types of research focusing on aspects of psychology and the law. While working with Dr. Wright, Dr. Nadja Schreiber Compo, and Dr. Steve Charman I became very interested in topics such as eyewitness feedback effects, investigative interviewing, as well as deception detection. Through the course of my research experience I was given the opportunity to conduct my own research project that focuses on deception detection and cognitive load. I presented my ideas to the Dr. Ronald E. McNair program, which in turn gave me the opportunity to further my research over the summer and become a McNair fellow. Currently, I am in the process of finishing my research project and will be graduating in December of 2010. Following graduation, I hope to be accepted into a doctoral program and continue my research in the areas of psychology and the law.

CAN YOU CATCH A LIAR? IDENTIFYING PHYSICAL SIGNS OF COGNITIVE LOAD

ABSTRACT

Studies have shown that cues generally thought of as being indicative of deception are actually just physiological traits of nervousness, and do not reliably differentiate between truths and lies (Vrij, Fisher, Mann, & Leal, 2006). Instead, studies have shown that liars portray physical signs as a result of cognitive load, such as a decrease in eye blinking (Vrij, Mann, Fisher, Leal, Milne, & Bull, 2008; Leal, Vrij, Fisher, Van Hooff, 2008). The present study examined whether the cognitive load approach could be used to train people to detect deception in others. Participants were trained in one of two ways to detect certain cues (nervousness and cognitive load). A control condition was included for comparison. Preliminary results show that participants trained to look for blinking patterns as a cue to deception were able to accurately detect deception 58% of the time. There was no significant difference when compared to the fidgeting group (56% accurate) and the control (53% accurate); however, more data is needed before inferences can be made. These preliminary results also show that those trained to use blinking patterns as a cue to deception may be better at detecting truths than any other group (blinking = 65%; fidgeting = 53%; control = 55%). Further data collection is currently underway.

Detecting Deception by Observing Physical Signs of Cognitive Load
Erika Nicole Fountain & Dr. Nadja Schreiber Compo, Florida International University

Abstract

Studies have shown that cues generally thought of as being indicative of deception are actually just physiological traits of nervousness, and do not reliably differentiate between truths and lies (Vrij, Fisher, Mann, & Leal, 2006). Instead, studies have shown that liars portray physical signs as a result of cognitive load, such as a decrease in eye blinking (Vrij, Mann, Fisher, Leal, Milne, & Bull, 2008; Leal, Vrij, Fisher, Van Hooff, 2008). The present study examined whether the cognitive load approach could be used to train people to detect deception in others. Participants were trained in one of two ways to detect certain cues (nervousness and cognitive load). A control condition was included for comparison. Preliminary results show that participants trained to look for blinking patterns as a cue to deception were able to accurately detect deception 58% of the time. There was no significant difference when compared to the fidgeting group (56% accurate) and the control (53% accurate) group; however, more data is needed before inferences can be made. Interestingly, preliminary results show that those trained to use blinking patterns as a cue to deception may be better at detecting truths than any other group (blinking = 65%; fidgeting = 53%; control = 55%). Further data collection is currently underway.

Introduction

There is an obvious need to find reliable cues to deception. A reliable indicator of deceit could help investigators in every phase of a criminal case. Generally, researchers agree that people are not good at detecting deception. There is also very little difference in their capability to distinguish between liars and truth tellers (Vrij, 2000). In most studies, lie detection precision falls just above chance (Vrij, 2000). This may be due to common misconceptions people and investigators alike have about cues to deception. Researchers have found that the behaviors that are more closely related to deception are signs of cognitive load (Vrij, Fisher, Mann, & Leal, 2008; Leal, Vrij, Fisher, & Van Hooff, 2008) not signs of nervousness, as most people believe.

Cognitive load refers to the amount of load put on working memory at any given time. Lying is cognitively taxing. A study by Leal and colleagues' study (2008) showed that cognitive load and deception are physiologically related. That is, lying is cognitively taxing and liars exhibit signs of cognitive load during the commission of a lie. One such sign of cognitive load is eye-blinking.

The present experiment tested if training individuals to look for signs of cognitive load (change in blink rates) improved accuracy rates of deception detection.

General Methods

Participants

Two hundred participants will be recruited from the Psychology Department at FIU using the SONA-systems website. To date, a total of 24 participants have completed this study . Participants received one research participation credit for their time.

Stimulus Material

The stimulus materials were acquired from Russano, Meissner, Narchet, and Kassin (2005). Ten videos (five portraying liars and five portraying truth tellers) of approximately a minute and a half in length were used to test participants. The videos depict a research assistant posing as an interrogator accusing a participant of cheating on an assignment. The participants were told that the consequence of cheating could include "academic misconduct", which led students to believe that they may be dismissed from the university. Some videos depict liars (i.e. students that cheated but deny it) and some videos depict truth-tellers (i.e., students who did not cheat and deny it). These videos are ideal because according to Vrij, Fisher, Mann, and Leal (2008), the cognitive load approach is to be used in an interview setting where the individual has something to lose. In the past, researchers have criticized the use of artificial stimulus materials. In most studies, students are asked to tell a lie (e.g., "pretend you stole a purse and tell it to the camera") and then these tapes are used as stimulus material. However, the students in these tapes have nothing to lose and may not display signs of deception. In contrast, the tapes used in this study more accurately mimic the real world, where criminals have something to lose.

Procedure

Participants entered the lab and were asked to sign a consent form. A total of 24 student participants were trained in one of the three conditions: Blinking (8), Fidgeting (8), or Control (8). All participants were then shown the same ten videos and were asked to make veracity judgments about the subject in each video. They were instructed to make these judgments using the training they had received prior. Following the videos participants were asked to fill out a short demographics questionnaire. Finally, participants were debriefed and thanked for their time.

Training Groups

Blink Group: This group was trained to look for a decrease in blinking during the interrogation followed by an increase directly after (cognitive load condition). Specifically, this group was told that research has found that people who lie blink less than people who tell the truth and that they should use this information when determining if the people in the videos they were about to watch were lying or telling the truth.

Fidgeting Group: This group was trained to look for a specific sign of nervousness (fidgeting) in the subsequent videos. Specifically, this group was told that research has found that people who lie exhibit signs of nervousness (e.g., fidgeting) and that they should use this information when determining if the people in the videos they were about to watch were lying or telling the truth.

Control Group: This group did not receive any training prior to viewing the video. This allows for a base-line analysis of deception detection accuracy without any prior instruction/training.

Results

Across training groups, the main dependent variable was overall accuracy rates. That is, how often participants correctly identified liars and truth tellers. Preliminary results revealed that the blinking group (n=8) had 58% accuracy across tapes, the fidgeting group (n=8) had 56% accuracy across tapes, and the control group (n=8) had 52% accuracy across tapes. Accuracy rates for "truths" (5 truth tapes) showed that the blinking group had an accuracy rate of 65%, the fidgeting group had an accuracy rate of 53%, and the control had an accuracy rate of 55%. All training groups performed at 50% accuracy for "lies" (5 lie tapes). An analysis of variance revealed no significant differences in accuracy rates between training groups, which was expected due to the small sample size. All groups displayed high confidence in their decisions with a mean of 6.7 out of 9. Further testing is underway.
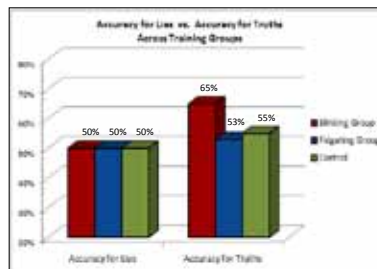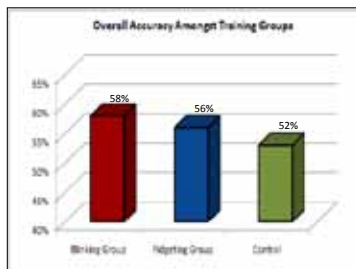
Discussion

Preliminary data suggests that training does not increase overall accuracy rates. However, there does seem to be a trend forming in terms of "truth" accuracy. As hypothesized, those trained to look for blinking patterns outperformed (65%) the fidgeting group (53%) and the control group (55%) in detecting truths. Although still early in the data collection process, current results give the impression that we can increase accuracy rates for detecting truths with the proper training. This is important because although we may not be able to detect deception all of the time, it could be made easier to identify when a suspect is telling the truth. Identifying truth tellers can decrease coercive interrogation practices. Studies show that individuals can be persuaded into giving false confessions (Russano, Meissner, Narchet, and Kassin, 2005). This training could also lead to a decrease in false confessions if an investigator is able to identify that a subject is telling the truth, instead of misinterpreting nervous cues for deceptive ones. If the supplemental data supports these assumptions, training protocols currently in use by police might one day include these reliable cues to better prepare officers for interviewing suspects. More data is currently being gathered to investigate the effect that training individuals to identify signs of cognitive load has on deception detection accuracy.

Acknowledgments

Overall Accuracy Amongst Training Groups — Blinking Group 58%, Fidgeting Group 56%, Control 52%

Accuracy for Lies vs. Accuracy for Truths Across Training Groups — Accuracy for Lies: Blinking Group 50%, Fidgeting Group 50%, Control 50%; Accuracy for Truths: Blinking Group 65%, Fidgeting Group 53%, Control 55%

OBJECTIVE

The present study examined whether the cognitive load approach could be used to train people to detect deception in others.

Juan Sebastian Gil

As a Latin American immigrant I am extremely grateful to the McNair Fellowship for providing a platform for my academic future. I was born in Maracaibo, Venezuela in 1987 though I have done all my formal education in the United States. My parents share a mixed Hispanic heritage which includes descendants Colombia, Venezuela, Costa Rica, Cuba, and Spain. My interest in politics in general, and Latin American Politics in particular, motivated me to study Political Science and Philosophy in FIU where I will be graduating fall of 2010 with a 3.9 GPA.

Since very early on I had the strong desire to help were not as fortunate as I was to study in such a prosperous country. I believe strongly the value of giving back to the community and investing one's youth and energy in places not so well off. I have been privileged to do community service work in Colombia, Venezuela, Honduras, Nicaragua, China, Kyrgyzstan, Kazakhstan, Puerto Rico, and the Dominican Republic. These experiences had forged in me the obligation to do my best to lead a life that that exemplifies the value of giving from one's time and energies to help those in need.

PARTY POLARIZATION AND IDEOLOGY
Diverging Trends in Britain and the United States

ABSTRACT

America's major political parties have traditionally been regarded as organizationally weak, highly decentralized, and ideologically incoherent by comparison with the highly disciplined, ideological class-based, parties of the UK. Indeed for a period after World War II American parties' scholarship tended to look approvingly at the UK as an alternative model of a well-functioning party system for modern advanced industrial democracies (Schattscheider 1942; Ranney 1962; Beer 1965). It was the late Leon Epstein (1980) in his 1979 APSA presidential address "What Happened to the British Party Model" who convincingly argued that the UK party system was no longer – if it ever had been – an appropriate model for American political parties. Since he wrote it appears that in several aspects American and British parties have become more similar. American political parties are now more ideologically polarized, more disciplined and united in Congress, and more centralized in their operations than they were in the postwar decades, when the APSA's famous report Toward a More Responsible Two Party System (1950), bemoaned the US parties' lack of those very characteristics. In the UK, by contrast, social change has eroded the dominance of the class-based political parties of mid-century, promoted ideological convergence between the Labor and Conservative parties, and assisted the increasing fragmentation of the British party system in the post-Thatcher era. Here we argue that contemporary American and British parties remain fundamentally different – particularly in their organizational aspect – and the apparent convergence is due more to changes in the respective societies as British society has become somewhat less polarized while American society has become more so since the 1960s. Both party systems have changed due to the erosion of mid-20th century class-based economic cleavages in both societies. In the United States this has been supplanted by an increasingly strong cleavage based on traditional moral values and religious observance that has polarized the major parties to an unprecedented extent. In the UK the same process has seen the rise of new cleavages based more on regional divisions, values and lifestyles, and integration into the European Union, rather than religious questions.

Party Polarization and Ideology
Diverging Trends in Britain and the United States

Abstract

America's major political parties have traditionally been regarded as organizationally weak, highly decentralized, and ideologically incoherent by comparison with the highly disciplined, ideological class-based, parties of the UK. Indeed for a period after World War II American parties' scholarship tended to look approvingly at the UK as an alternative model of a well-functioning party system for modern advanced industrial democracies (Schattscheider 1942; Ranney 1962; Beer 1965). It was the late Leon Epstein (1980) in his 1979 APSA presidential address "What Happened to the British Party Model" who convincingly argued that the UK party system was no longer – if it ever had been – an appropriate model for American political parties. Since he wrote it appears that in several aspects American and British parties have become more similar. American political parties are now more ideologically polarized, more disciplined and united in Congress, and more centralized in their operations than they were in the postwar decades, when the APSA's famous report *Toward a More Responsible Two Party System* (1950), bemoaned the US parties' lack of those very characteristics. In the UK, by contrast, social change has eroded the dominance of the class-based political parties of mid-century, promoted ideological convergence between the Labor and Conservative parties, and assisted the increasing fragmentation of the British party system in the post-Thatcher era. Here we argue that contemporary American and British parties remain fundamentally different – particularly in their organizational aspect – and the apparent convergence is due more to changes in the respective societies as British society has become somewhat less polarized while American society has become more so since the 1960s. Both party systems have changed due to the erosion of mid-20th century class-based cleavages in both societies. In the United States this has been supplanted by an increasingly strong cleavage based on traditional moral values and religious observance that has polarized the major parties to an unprecedented extent. In the UK the same process has seen the rise of new cleavages based more on regional divisions, values and lifestyles, and integration into the European Union, rather than religious questions.

Methodology

In order to determine the degree of convergence and divergence in respective party models between the US and UK, we rely mainly on Duverger's model of mass parties. The indicators of the mass party model includes a high number of dues paying members, a hierarchical top-down organization within the parties, a disciplined vote by party members within parliament, and an clear ideological platform espoused by the parties. As already mentioned, America has never developed mass party's like most Western democracies, in particular European countries. Because our work is therefore an assessment of degree and quality, rather than absolutes and quantity, additional theories are paramount to expand our explanation of the effects social and political change have had on the party models in the UK and Us respectively. For example, Inglehart's theory of the change in voter priorities in times of peace of prosperity within democracies is useful to provide a likely explanation on the degree of economic consensus between Conservative and Labor in the post-war period. Additionally, the works of several other political scientists are referenced in an inclusive attempt to incorporate their observations in order to produce a broad, cohesive, and intuitive assessment of the changes within the parties.

Causes of the UK Mass Party Model

- In the 20th century British parties exemplified Duverger's mass party model
  - Strong two part system: Conservative vs. Labor
  - Mass of dues paying members, hierarchical party structure, high discipline within parliament and ideological party platform
- Simultaneous causes of the mass party system
  - Fallout of rapid industrialization and swelling of working labor class
  - Rise of ideological socialist rhetoric and trade union movement
  - Expansion of voting rights to a mass citizenry
- Conservatives adopt to form Duverger's "contagion from the left"

Causes of America's "Cadre" Alternative

- Lack of a strong socialist movement coupled with individualistic culture preempted mass parties
- America party innovated by 1820's model-Jacksonian democrats
  - Regionally based local leaders that rallied voters mostly at state level
    - By 1840's the party model had evolved into party bosses that traded votes for political spoils
  - National convention achieved only every four years for presidential election
- Progressive reforms in 20th century furthered weakened chances at national mass parties

US and UK since the 1970's

- UK: Social change eroding foundations of mass parties
  - Decrease in percentage of manual laborers and rise of professional white collar workers, improvement of working conditions by labor movement, and a shift to more value-laden and lifestyle oriented political conversation
  - Fracturing of mass party politics by a decrease in party membership, decline of two-party vote within a now federalized UK, and the rise of third parties: the liberal party and national parties in Scotland, Whales and Ireland
- US: Parties have become more polarized and centralized
  - McGovern-Frasier reforms permitted national party committees to wield more influence over local party
  - The combination of the Democrats adoption of civil rights movement and gerrymandering has allowed the increasing polarization of politics along conservative and liberal lines

Discussion

In short the changes noted by Epstein (1980) in the traditional British party model so venerated by postwar American party scholars, have been accelerated and reinforced since he delivered his APSA presidential address in 1979. The UK has continued to move toward a multiparty system and the prevalence of the old mass parties – Labour and Conservative – has eroded in favor of newer party formations more reflective of a less class-based British society. Given this situation it seems less likely than ever that the British parties and party system could ever again serve as a model for the US. Conversely it appears that the influence has recently been more in the other direction, as the British parties – both old and new – have taken on more attributes of the contemporary American party in service in terms of organization, financing, and campaigning, and reduced emphasis on traditional class-based ideologies. To this extent there is now probably greater convergence in the nature of party politics between Britain and the US than at any time since the cadre party era of the early 19th century. This convergence toward the American "party in service model" is not unique to Britain, of course as trends in party organization and competition in the other major democracies since World War II have been in the same direction: postmaterialism, less emphasis on class politics, the decline of class based parties, more values-based politics and parties, and the development of sub-national party systems. The separation of powers in the US as opposed to the European parliamentary systems probably continues to be the most significant factor in structuring the essential differences between American parties and those of Britain and the other European democracies.

Results

The fundamentals of the American political system have not changed since Epstein (1980) wrote, but the US parties have undoubtedly become more polarized and ideological while Britain's – as we have seen in the preceding section – have become somewhat less so and the mass party organizational form of the major parties has come considerable strain. From this it would appear that party polarization is not a product of strong party organization but deeper societal forces. The UK experience during the 20th century has been that the mass party format can coexist easily with stable, consensual government, with party ideology being more emphasized in terms of rhetoric and ritual than policy practice when Labour or the Conservatives have been in government. In the US the mass party never developed and US parties remain organizationally weak (although their national organizations are currently more vigorous than at any previous point in US history). Yet the existence of increasingly strong cultural cleavages in American society has polarized the party system as party activity at all levels has become dominated by single-issue activists and interest groups on either side of the cultural-religious divide. The end result has been a party system that more closely matches the prescriptions of the 1951 APSA report although whether this has had the desired positive effect on the quality of American democracy and government is highly debatable.

Acknowledgments

OBJECTIVE

Determine the degree of convergence and divergence in respective party models between the US and UK.

German Gomez

My name is German Felipe Gomez. I am originally from Bogota, Colombia. I move United States at the age of 15 just in time to start High School. As a senior in Computer Engineering I realize that I will like to pursue my true passion and go to graduate school and obtain a Ph.D. in Computer Science. From a very young age I developed a passion for computers and technology in general. I decided to become a Computer Engineer to follow my passion and to understand the connection between and electronics and programming required to make things operate. The McNair program has allowed me to conduct research in order to be better prepared for future academic challenges. Financially speaking, programs like this facilitate our passion for learning by rewarding the effort and work that we put in our studies. I started FIU back in 2005; I participated on the National Student Exchange and spend a Year in California attending California State University San Bernardino. The summer of 2010 I attended University of California Berkeley to do research with The Team for Research in Ubiquitous Secure Technology working with in Cookies and Internet Privacy. My goal is to obtain a Ph.D. in Computer Science and work for academia and research about the Internet and future technologies available. I plan to give back to the community and especially to third world countries where technology is limited. One day I will be like my father and pass on the knowledge to my children and younger generations hoping to inspire and educate the future of this world.

COOKIE BLOCKING AND PRIVACY: FIRST PARTIES REMAIN A RISK

ABSTRACT

HTTP cookies are small files that can make surfing the web faster and more convenient. They can allow sites to recognize returning users so that they can avoid repetitive log in procedures when they visit their favorite sites. Although these types of cookies can be beneficial, they can also be used by third parties to track users. When a user visits a domain and cookies are set on their machine directly from that site's server, these are called first-party cookies. When a third-party site sets cookies on this same domain, activity as they navigate within the domain and even when they leave to visit other domains. In the past few years, the five major shipping browsers have all implemented new privacy settings to help stop users from having their activities tracked.

In this paper, we describe our investigation of the effects of cookie blocking and privacy. We conducted two experiments to determine the effectiveness of cookie blocking in different browsers. Our first experiment was to collect raw statistics from all five major browsers while visiting all of Quantcast's top 100 sites. We wrote a code in Python that opened all 100 pages at once in each browser, and then counted the number of cookies that were set, prevalence of each cookie name and the number of unique domains that set cookies. We ran this experiment with third-party cookies blocked and unblocked to compare the difference in each browser. Our second approach was an analysis of traffic to get a closer look at the exchange of cookies between our machine and different web servers using Wireshark. When we opened individual packets, we were able to locate the source IP addresses and domain names that the cookies originated from so we could tell who was setting cookies.

In our numerical results, we found that tracking cookies make up about 25% of all of the cookies set throughout our testing. Through traffic analysis, we found that third parties are finding alternative ways to set cookies on user's machines by making them appear as first party cookies. That being said, we can say that many first party cookies could still potentially be trackers.

Cookie Blocking and Privacy: First Parties Remain a Risk

German Gomez,[1] Chris Hoofnagle JD,[2] Mario Garcia[3]
[1] Computer Engineering, Florida International University
[2] School of Law, University of California Berkeley
[3] Computer Science, Texas A&M University Corpus Christi

INTRODUCTION

The HTTP cookie was created to store textual information that a web application can use to identify clients and provide a state of information. A cookie is a small text file stored on a user's computer. Cookies are employed for a variety of reasons including enhancing user's online experience by helping sites recognize users when they return.

Cookies can be used to track users on the internet. Our colleagues found in 2009 that over 70% of a large sample of websites contained tracking cookies for Google Analytics.

RESEARCH GOAL

Traditionally, advertising networks tracked consumers using third party cookies. In recent years, some internet browsers have given users better tools to block these cookies, and t o block them by default. We are investigating whether blocking third party cookies is effective in avoiding tracking by third parties.

METHODS

We select two foundations for this project: we used the top five web browsers on the market to visit the top 100 websites, ranked according to Quancast in July 2010.

We focused on two browser scenarios: first, we visited the top 100 websites with the default cookie settings in the browser. Firefox, Chrome, and Opera accept all cookies by default, while Safari blocks third party cookies, and Internet Explorer blocks third party cookies on sites lacking a compact privacy policy. Second, we took a standard privacy intervention: we blocked third party cookies in the browsers and then visited the same sites.

A top level view flowchart (Figure 1) outlines the entire procedure.
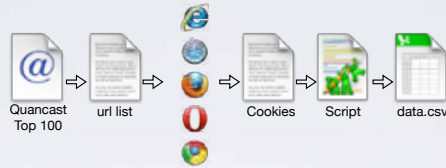
Figure 1. Method Flowchart.

RESULTS

Blocking third-party Cookies does reduce on average 40% the number of cookies on the browser as seen on Chart 1. From that same chart, one can see a 2:1 relationship between the number of unique cookie name and the unique cookie domain. However, despite blocking third-party cookies, we find that tracking cookies are still present in the form of first party cookies. The Results in Chart 2 represent a detail view from Apples' Safari 5.0 web browser. In our domain analysis we found there are some cases when third-parties double the number of cookies set on the browser versus the top 100 websites. Among the top cookie name we found strings such as __umta , __qca and s_vi among others belong to companies like Google, Quancast and Omniture. In spite of the fact that blocking third-party cookies reduces by 40% on average , tracking cookies make up more than 25% on average from the total number of cookies on this test.
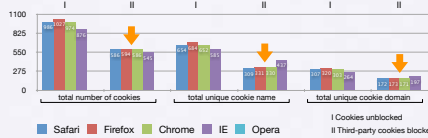
Chart 1. General Analysis Top Web Browsers.

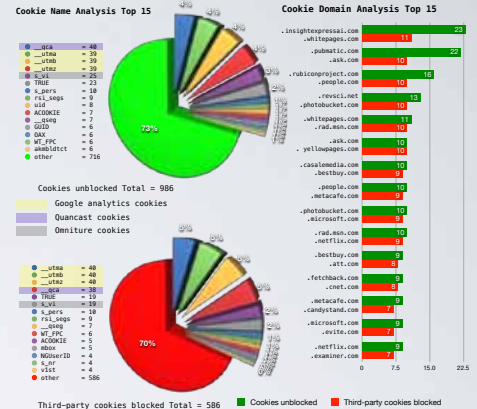

Chart 2. Data Analysis from Safari 5.

CONCLUSION

In fact 33% of the sites that issue the most number of cookies, in our visit to the top 100 with cookies unblocked, were actually from different domains. These cookies were still set when we blocked third party cookies. Thus, users who wish to avoid web tracking through cookies must also block some first party cookies.

FUTURE WORK

Policymakers and web browser developers should take a closer look to resolve third party tracking. Recent research by EFF has shown cookies are only a small piece of information used for tracking, implemented by third party companies. New trends involve a technique call fingerprinting. Research should concentrate of providing a secure and safe internet experience not at the expense of users' privacy.

OBJECTIVE

We are investigating whether blocking third party cookies is effective in avoiding tracking by third parties.

Sashay A. Goodletty

I was born in Westmoreland, Jamaica and came to the U.S. when I was five years old. Ever since I was in elementary school, I knew I wanted to have a career working with children. After years of debating, I decided in my freshmen year of high school that I wanted to be a Child and Adolescent Counseling Psychologist. In the future I will like to work as a researcher, professor, and psychologist. My research interests include parent-child relationships, parental depression and child outcome, and the role of fathers. Right now (and for the next five or six years) school takes up a lot of my time, but I do enjoy time spent away from my studies. In my spare time, I like to read and watch television, especially old episodes of A Different World, Living Single, and Who's the Boss. I also like to go out and eat with friends. My biggest dream is to help all at-risk youths in the world. I've always been fascinated with children and adolescents. During high school, I witnessed many of my peers on negative life trajectories, whether it was drugs, violence, or even depression. I always asked myself "why are these things happening?" and I realized during my first year at FIU, that research can help me find answers to such questions. During my spare time, I enjoy working out, reading and watching re-runs of A Different World, Bones, and The Nanny.

ABSTRACT

PARENT-ADOLESCENT RELATIONSHIPS AT THE ONSET OF THE CHANGING LIVES PROGRAM INTERVENTION AND IMPLICATIONS FOR LATER IDENTITY DEVELOPMENT
Sashay A. Goodletty, Alan Meca, & William Kurtines

This study was conducted to determine the quality of parent-adolescent relationships using the Relational Data Analysis strategy at the onset of the Changing Lives Program intervention. It sought to examine contextual differences in maternal and paternal relationships, such as ethnicity, gender, and the interaction between the two across conditions at baseline. There was a sample size of 437 participants, with approximately 54% being African-American and approximately 46% being Hispanic-American. The participants were between the ages of 13-18 and attended four alternative high schools in the Miami area. It was hypothesized that participants in the CLP condition will have a poorer parent-adolescent relationship (i.e. low levels of communication and involvement) than the control condition. Results showed no difference between the participants in the CLP intervention condition and the participants in the control condition in terms of how they described their parent-adolescent relationships. The only difference detected was that of gender and paternal-adolescent relationships, with males reporting more positive relationships with their fathers than their female counterparts. Current literature illustrated the association between parent-adolescent relationships and the identity processing styles during adolescence and further research on the present study can also contribute to the current literature in groundbreaking ways.

Parent-Adolescent Relationships At the Onset of the Changing Lives Program and Implications for Later Identity Development

Sashay Goodletty, Alan Meca, & William Kurtines
Florida International University

Background and Significance

❖ A growing literature on promoting positive youth development began to unfold in the 21st century. This new trend, known as the Positive Youth Development Movement, is due to three occurrences:

1. The emergence of applied developmental science (ADS), which is the scientific investigation that focuses on the use of research and application to promote positive development across the life span.

2. The shift in how the period of adolescence was viewed: instead of being viewed as problems to be managed, adolescents were conceptualized as resources to be developed (Roth & Brooks-Gunn, 2003).

3. Transformations in the intervention science allowed attention to be allocated to prevention and not just treatment alone.

❖ The Youth Development Project is a manifestation of the Positive Youth Development Movement. As such, its goal is to foster positive development among at-risk youth. This population of adolescents are usually from disempowered environments characterized by poverty, violence, drug use and abuse, and limited access to vital resources.

❖ An implementation of YDP is The Changing Lives Program (CLP). Its main goal is to generate a context in which troubled youth can transform their sense of control and responsibility and change their negative life trajectories into positive ones (Kurtines, et al., 2008).

❖ Recognizing that identity formation is a pivotal event during the adolescent developmental period, a key objective of CLP is to help at-risk adolescents create positive self identities.

❖ While wrestling with their "identity crisis," adolescents are also undergoing biological, social, and cognitive changes. These changes have numerous effects, especially on parent-adolescent relationships. Consistent with the findings on the cognitive changes of adolescence, adolescents begin to question and challenge issues that were previously viewed as legitimate for their parents to regulate, thus creating a context for contentions.

Research Aims

❖ Research Aims
1. The first aim was to use Relational Data Analysis to assess the quality of parent-adolescent relationships at the onset of the CLP intervention and to develop qualitatively different categories that assess the quality of paternal and maternal relationships.
2. The second aim was to examine differences in parent-adolescent relationships across ethnicity, gender, and conditions at baseline. Additionally, the current study sought to detect differences across conditions at baseline as moderated by ethnicity, gender, and the interaction between ethnicity and gender.
❖ Hypothesis
1. It was hypothesized that participants in the CLP condition will have poorer parent-adolescent relationships (i.e. low levels of communication and involvement) than the participants in the control condition.

Methods

❖ Participants

There was a sample size of 437 participants. Approximately 54% were African-American and approximately 46% were Hispanic-American. The participants were between the ages of 13-18 and attended four alternative high schools in the Miami area.

Those that served in the CLP intervention condition were referred by school counselors, teachers, and administrators. The control condition was comprised of randomly selected students who had never participated in the CLP intervention in previous school semesters.

Each participant completed an IRB approved parental consent and student assent forms before joining the intervention and control conditions.

❖ Measures

Parent-adolescent relationships were assessed using the Background Information Form-Updated (BIF-U). The BIF-U is a 33 item assessment that seeks to gain as much background knowledge as possible about each participant. Items number 11 and 12 were of particular interest because they inquired about the participants' relationship with their mothers and fathers. The guiding question asked to participants was: "How would you describe your relationship with the following? E.g., Do you spend time with the person, can you communicate openly? Explain." The responses to items 11 and 12 were coded using the Relational Data Analysis technique.

Figures and Tables

RDA Structural Tree Chart: Categories of Parent-Adolescent Relationships

Table 1 Father-Adolescent Relationship						
	Paternal Relationship					
	Condition		Ethnicity		Gender	
	CLP (n)	Control (n)	Hispanic American (n)	African American (n)	Female (n)	Male (n)
Closed/Uninvolved	110	52	76	86	98	64
Limited	39	19	24	34	28	30
Open/Involved	69	36	51	54	55	50

Table 2 Mother-Adolescent Relationship						
	Maternal Relationship					
	Condition		Ethnicity		Gender	
	CLP (n)	Control (n)	Hispanic American (n)	African American (n)	Female (n)	Male (n)
Closed/Uninvolved	44	13	31	26	36	21
Limited	53	30	37	46	45	38
Open/Involved	109	60	74	95	90	79

Results and Discussion

❖ Research Aim I
During the conceptual analysis phase of RDA, the theory neutral coders constructed three categories to describe parent-adolescent relationships: Open Communication, No Relationship, and Weak Relationship.

During the theoretical analysis phase, new categories were created and are depicted in the RDA Structural Tree Chart below. The descriptive statistics for the categories are represented in Table s 1 and 2 below.

❖ Research Aim II
In order to detect statistically significant differences, the Wilcoxon Rank Sum Test was conducted.

Wilcoxon Rank Sum Test detected a marginally significant (2-tailed value .077) non-zero Z-score, suggesting group difference between male and female participant's subjective evaluation of their paternal relationship at level 1. Specifically, the Wilcoxon Rank Sum Test reported a Z score of -1.769, or that the sums of the ranks of group 2 (males) were less than that of group 1 (females) at the normal confidence level of 0.05.

No additional differences were detected.

❖ Discussion and Future Research

When considering the four parenting styles developed by Baumrind (1978), effective communication and involvement (similar to this study's open and involved relationship category) are the pillars of parenting styles and thus parent-adolescent relationships. Due to the similarity between Baumrind's theory of parent-adolescent relationships and the categories developed during the RDA process of this study (Baumrind's theory was the guiding theory during the TOC phase), it is possible that the same effects that Baumrind (1978) and Berzonsky (2004b) described will also occur with the participants in the current study.

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OBJECTIVE

To determine the quality of parent-adolescent relationships using the Relational Data Analysis strategy at the onset of the Changing Lives Program intervention.

Gabriella Harari

I am a senior at Florida International University, double majoring in Psychology and the Humanities. This past summer 2010 I became a fellow of the UC Berkeley Summer Research Opportunity Program (SROP), through which I was able to carry out a research project examining social class influence on worldview formation. I am currently a research assistant for a lifespan development lab in the psychology department called the Miami Youth Development Project (YDP). I will be graduating in the spring of 2011 and plan on beginning a PhD program in the fall. In the meantime, I am working on my honor's thesis which will be a pilot study examining the effects on identity of the recently launched university-based positive Adult Development Project (ADP).

My research interests lie in the fields of personality and social psychology. Specifically, I am interested in identity development, perceptions of self and other (impression formation), and social behavior. I seek to examine how social and media factors affect cognition, both within the individual and across cultures. In my leisure, I enjoy writing, painting, gaining new perspectives, reading, art history, and drinking coffee in the mornings. I truly believe that traveling opens minds and presents us with necessary alternative perspectives.

LOWER-CLASS UNCERTAINTY AND THE FORMATION OF UNPREDICTABLE WORLDVIEWS

Gabriella Harari[1], Paul K. Piff[2], Michael W. Kraus[2], & Rodolfo Mendoza -Denton[2]

ABSTRACT

Social class, socioeconomic status, or SES shapes how people experience and perceive events in their lives. In the present study ($N = 202$), we tested whether social class influences people's views of the world as predictable or unpredictable. We expected that lower social class gives rise to an unpredictability schema: a view that one's life and the world more generally are unpredictable and chaotic. We assessed social class using both objective measures (annual household income and educational attainment) and subjective measures (perceptions of rank vis-à-vis others), and assessed unpredictable worldviews using a 13-item measure (e.g., "The world is chaotic"). We found that lower-class individuals endorsed an unpredictable worldview, relative to their upper-class counterparts, who viewed the world as less chaotic and more predictable. Furthermore, when pitted against one another, subjective SES remained a significant predictor of unpredictable worldviews, whereas objective indices of social class were no longer significant. These findings have important implications for goal setting, risk-taking behavior, and interpersonal relationships.

[1]Florida International University, [2]University of California, Berkeley

Lower-class Uncertainty and the Formation of Unpredictable Worldviews

Gabriella Harari[1], Paul K. Piff[2], Michael W. Kraus[2], & Rodolfo Mendoza-Denton[2]

Florida International University[1], University of California, Berkeley[2]

Introduction

• Individual perceptions of the world are shaped by life circumstances and experiences with the surrounding environment.

• Social class —indexed as a person's resources and rank in a social hierarchy— influences causal explanations of events in one's personal life and the world (Kraus, Piff, & Keltner, 2009).

• Research on wealth disparities in the U.S. report households in the top 1% of the wealth distribution to be more than 800 times wealthier than the individuals in the bottom 40% (Diaz-Gimenez, Quadrini, & Rios-Rull, 1997).

• Given the divergent experiences and life circumstances of upper- and lower-class individuals, one can assume that worldview beliefs would reflect these differences.

Hypothesis

We expected that lower-class individuals would endorse unpredictable worldviews, relative to their upper-class counterparts.

Methods

Participants

A national sample of 202 adult volunteers (137 women, 58 men, 7 declined to state), 64% European-Americans, 36% other ethnicities. Age ranged from 18-72 years ($M = 33.93$, $SD = 13.331$).

Procedure

Participants were provided with a link to the online study. After giving consent, participants were instructed to complete a survey.

Measures

• *Objective social class*. Participant educational attainment and income were standardized and averaged.
  • 43% reported high school diploma as highest level of education, 49% reported annual incomes between $35,000-$50,000 or less.

• *Subjective Social Class*. the MacArthur Scale of subjective SES uses a 10-rung ladder to assess subjective perceptions of level of education, income, and occupation status relative to other members of the larger community ($M = 6.09$; $SD = 1.98$).

• *Unpredictable worldview beliefs*. 13-item quantitative measure adapted from Ross & Hill's (2002) unpredictability schema. Rated on a scale 1(strongly disagree) to 7(strongly agree).
  • Cronbach's $\alpha = .75$
  • Ex: "At any moment, things in my life could change" and "The world is chaotic".

• *Personal Control*. a one-item measure indicating how much control participants felt over their own lives on a scale from 1(none at all) to 10(a great deal). ($M = 6.87$, $SD = 2.12$)

Results

• We found that lower-class individuals endorsed an unpredictable worldview, relative to their upper-class counterparts, who viewed the world as less chaotic and more predictable.

• When objective and subjective social class were pitted against one another, and while accounting for control variables: subjective perceptions of rank were significantly related to unpredictable worldview beliefs ($\beta = -.24$, $t(176) = -3.145$, $p < .01$), as was personal control ($\beta = -.341$, $t(176) = 5.002$, $p < .01$).
  • However, objective social class was no longer significant ($\beta = -.02$, $t(176) = -.304$, $p < .76$).

Table 1. *Correlations (Above the Diagonal) and Partial Correlations (Below the Diagonal) Between Social Class, Unpredictable Worldview, and Personal Control, Controlling for Participant Age and Ethnicity*

Variables	Obj. Social Class	Subj. Social Class	Unpred. Worldview	Personal Control
Obj. Social Class	——	.43**	-.20**	.13
Subj. Social Class	.44**	——	-.31**	.13
Unpred. World-view	-.19*	-.31**	——	-.39**
Personal Control	.17*	.18*	-.39**	——

Discussion

• Findings suggest that having economic resources to rely on provides the individual with a safeguard against unexpected hardship (e.g., car accidents, job loss), rendering life and the world in general as more orderly and predictable.

• The findings from the present study are consistent with previous research finding subjective perceptions of rank to be stronger predictors of class-based differences in social event explanations (Kraus et al., 2009), highlighting the utility of assessing subjective perceptions of individual experiences with the objective, material conditions of social class.

• Future studies should examine the relationship between unpredictable worldviews, interpersonal relationships, goal-setting, and the likelihood of engaging in risk-taking behavior to assess the role unpredictability beliefs play in planning for the future.

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Acknowledgements

OBJECTIVE

We expected that lower-class individuals would endorse unpredictable worldviews, relative to their upper-class counterparts.
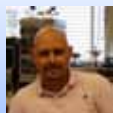
Reinier Hernandez

Reinier Hernandez entered Florida International University in 2009 as a transfer student from a Radiochemistry Bachelor's degree program from Havana, Cuba. Reinier is currently pursuing a Bachelor of Science degree in Chemistry at FIU. Reinier joined the DOE/ FIU Science and Technology Initiative program in May 2009; program in which he has been involved in research focused on the evaluation of polyphosphate technology for uranium remediation at DOE Hanford Site in Washington State. As a result of his work on DOE related investigation he presented a poster at the National DOE conference: Waste Management 2010. In January, in recognition to his academic and research excellence he was selected to integrate the 7th FIU chapter of Ronald E. McNair Post Baccalaureate

Achievement Program. In summer 2010, Reinier was selected by the AMGEN foundation to be part of its AMGEN Scholar Program, thanks to which he had opportunity to go to an internship at Massachusetts Institute of Technology. While at MIT he was selected to represent MIT scholar with an oral presentation at the annual AMGEN Scholars Symposium celebrated at UCLA, here he presented his work at John Essigmann Laboratory at MIT. Back at FIU he resumed his work with the DOE Fellowship program, and is currently working on a project related with the analysis of calcite dissolution as part of a uranium remediation technology. Recently, Reinier was invited to 2010 Berkeley Edge conference were he was oriented on how to succeed at applying for graduate school.

VARIOUS FUNCTIONS ON DNA SUBSTRATES BY E. COLI ADAPTIVE RESPONSE PROTEIN AlkB

ABSTRACT

Recent findings suggest that E. coli adaptive response protein AlkB can react with DNA substrates through various mechanisms rather than its regular oxidative dealkylation repair pathway. AlkB aging seems to play an important role in the manifestation of these concomitant reactions. In vitro reaction experiments of alkylated DNA substrates (3, N4-ethenoCystosine, 1- with one freshly prepared AlkB and two aged AlkB were performed; the results were analyzed using Liquid Chromatography Electro spray – Time of Flight Mass Spectrometry (LC-MS ESI-TOF).

Various Functions on DNA Substrates
by *E. coli* Adaptive Response Protein AlkB

Reinier Hernandez, Deyu Li, Caroline E. Hagerman, John M. Essigmann
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Recent findings suggest that *E. coli* adaptive response protein AlkB can react with DNA substrates through various mechanisms rather than its regular oxidative dealkylation repair pathway. AlkB aging seems to play an important role in the manifestation of these concomitant reactions. *In vitro* reaction experiments of four alkylated DNA substrates (1,N^6-ethenoAdenine, 3,N^4-ethenoCytosine, 1-methylAdenine, 3-methylCytosine) with one freshly prepared AlkB and two aged AlkB were performed; the results were analyzed by using Liquid Chromatography Electro spray - Time of Flight Mass Spectrometry (LC-MS ESI-TOF).

E. Coli Adaptive Response

Alkylation Damage

ENDOGENOUS   EXOGENOUS

ADAPTIVE RESPONSE   REPAIR MECH.

Alk B   AlkA   AdA   AidB

AlkB
216 amino acids with a M.W ~27 KDa
α-ketoglutarate and non-heme Iron dependent dioxygenase
Versatile enzyme: acts on many substrates
AlkB has 9 mammalian homologs : ABH1-8 and FTO
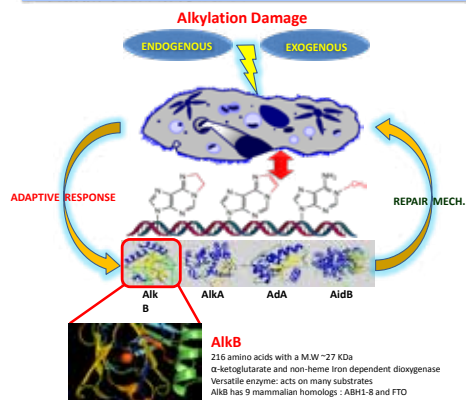
Experimental Procedure

AlkB repair *in vitro* reactions
•Eight 25 µM solutions of 16-mer oligonucleotides of sequence 5'-GAAGACCTXGGCGTCC-3' (X=m3C,eA,eC,A,G,T,C,m1A) were prepared.
•Four sets of reactions were prepared (blank, fresh AlkB, two aged AlkB).
•Four µL of a mixture of HEPES buffer (pH 8.0), 67µM Fe(NH$_4$)$_2$(SO$_4$)$_2$·6H$_2$O , 0.9 mM α–Keto glutarate, and 1.8 mM ascorbate were added to the reaction.
•The reactions were performed using 100 µM of DNA and 50 µM of AlkB for a total volume of 10µL.
•The reactions were incubated 1h at 37 ºC and then analyzed by LC-MS ESI-TOF.
LC-MS ESI-TOF
•The analysis were performed in an Agilent ESI-TOF mass spectrometer (Palo Alto,CA) with a needle voltage of 3.5 kV.
•Nitrogen gas was used as dryer (10 L/min) and nebulizer (15 psig) with a heated capillary at 350 ºC.
•The LC separation were performed using an integrated Zorbax SB-Aq (2.1x150mm, 3.5 µm; Agilent Technologies) column.
• A 0.2 mL/min mixed gradient was used to elute the reaction products (solvent A, 10mM ammonium sulfate) (solvent B, acetonitrile).
•Data analyses were performed on Agilent Mass Hunter Workstation.

Results

Fig.1 Mass spectra (-4 charge state) of the DNA/AlkB *in vitro* reaction. A) Spectrum of 5'-GAAGACCTXGGCGTCC-3' [X=eA] oligonucleotide. B) Spectrum of 5'-GAAGACCTXGGC GTCC-3' [X=eA] oligonucleotide in presence of AlkB.

A
1227.72

B
1221.73   1227.72   1232.2   1236.25
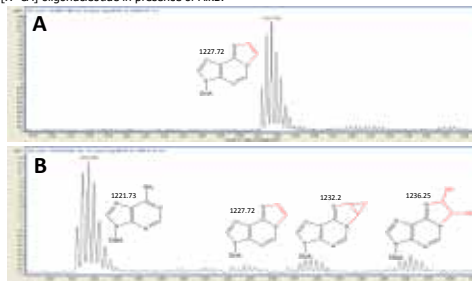
Fig.2 Comparative mass spectra (-4 charge state) of the DNA/AlkB/aged AlkB *in vitro* reaction.

Fresh AlkB
Low AP   1251.23

Aged AlkB
High AP   1251.23
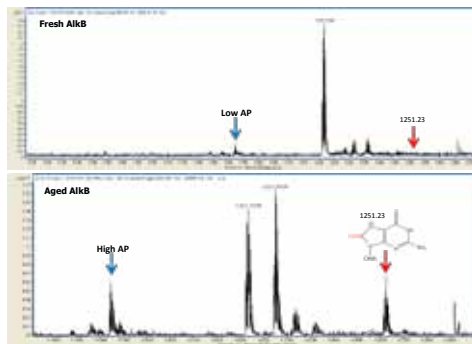
Discussion

Fig.3 Regular AlkB reaction mechanism.

The reaction intermediates detected in the mass spectra agree with the type of mechanism proposed for AlkB dealkylation repair process.

Fig.4 Concomitant reactions of aged AlkB on DNA. A) Base excision reaction. B) Oxidation of Guanine to 8-Oxoguanine.

A)

B)

Different mass peak profiles were observed between newly prepared AlkB and the aged ones. The presence of higher mass peaks indicate the oxidation of Guanine to 8-Oxoguanine in the oligonucleotide. An increment on the base excision product was observed .

Conclusions

➢The newly prepared AlkB showed only the regular oxidative repair products.
➢Aged AlkB seems to form 8-Oxoguanine preferably with eA and eC DNA substrates.
➢The base excision mechanism was manifested to a great extent with aged AlkB.

Future Direction: Find the mutations/modifications in the protein responsible for its unusual behaviors. Relate them with the structure of the active site.

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OBJECTIVE

The discovery of anomalous behavior of AlKB is of vital importance. The formation of 8-oxoguanine and AP sites very often lead to mutations that in many cases are genetic diseases and cancer precursors.

David R. Jaramillo

David Jaramillo is a senior at FIU who is double majoring in Human Resource Management & Psychology. David is a member of the FIU Honors College, and has the honor of being a 2009 APA PRIME (Psychology Research Initiatives & Mentorship Experience) Fellow. He is an also affiliate of The Society for Industrial-Organizational Psychology (SIOP), Academy of Management (AOM), and Society for Human Resource Management (SHRM). Outside of his McNair research, David has served as Lab Manager at FIU's Industrial-Organizational Psychology Laboratory, and as a Research Assistant at FIU's Infant Development Laboratory. David is also President of FIU's Chapter of Psi Chi, The National Honor Society in Psychology, which this year celebrated its 36th anniversary on campus, and has been recognized as FIU's best Honor Society for the last 6 years in a row. David also has some work experience under his belt, having interned as a Human Resources Generalist for a Fortune 500 company in the financial services industry. David is on track to graduate Summa cum laude in Spring 2011 and intends to pursue a PhD from either Harvard Business School, The Wharton School at the University of Pennsylvania, or MIT's Sloan School of Management.

FACILITATING TEAM TRANSACTIVE MEMORY THROUGH PERFORMANCE FEEDBACK

In this study participants (N=76) were trained individually to assemble telephones, and performance reviews on the assembly task were collected at the end of the session. Approximately one week later, participants returned to assemble the telephones in groups of three. The experimenter manipulated how the performance feedback was distributed to the group. There were three conditions -- feedback given to one person, feedback to the entire group, and finally, no feedback returned at all. The study found that the group feedback condition committed significantly fewer errors, and on average took less time (though not of significance). In comparison, the single person feedback condition had a large variability in time taken to complete the task, and a significantly higher rate of error. The group without feedback took the longest and had a large variability in number of errors committed. Future research should investigate these effects on more complex tasks that span more than one sitting, as well as in virtual teams.

ABSTRACT

Facilitating Team Transactive Memory Through Performance Feedback

David R. Jaramillo, Research Mentor: Bennett L. Schwartz, Ph.D
McNair Fellowship Program, Florida International University, Miami Florida, 2010

ABSTRACT

In this study participants (N=61) were trained individually to assemble telephones, and performance reviews on the assembly task were collected at the end of the session. Approximately one week later, participants returned to assemble the telephones in groups of three. The experimenter manipulated how the performance feedback was distributed to the group. There were three conditions -- feedback given to one person; feedback to the entire group, or no feedback at all. The study found that providing the feedback to one person led to faster completion times, albeit with more errors. The group condition took longer, but committed significantly less errors on the task. The group without feedback took the longest and had a larger variability in number of errors committed.

PURPOSE

In 2008 the average firm spent upwards of $1,202 *per employee* on training and development. In this study, we aim to determine whether an entire group must receive performance feedback, or if relaying the feedback to one person is enough to achieve satisfactory group performance and transactive memory formation. Considering the high cost of training, we believe that our research may be of use in instances in which training may not be possible, such as in cases where trainees may be geographically dispersed, or where training may be too expensive or infeasible.

LITERATURE REVIEW

Transactive memory is defined as a set of information possessed by each individual member of a group that allows a shared awareness of who knows what within the group (Wegner, 1987).

Moreland and Myaskovsky (2000) found that it was possible to artificially create transactive memory systems by providing groups that were trained apart with feedback on each other's skills and weaknesses, and that these groups performed as well as other groups that had been trained together. They argue that it is possible to enjoy the benefits of transactive memory without initial group training. We sought to build on their research, and hypothesized that groups in which one individual receives feedback would perform on par with groups in which all members receive feedback.

PARTICIPANTS

Ninety-two students (39 males and 53 females) participated in our research study. Excluding the pilot studies and five groups which were excluded due to either a lack of participants or experimenter error, the final sample consisted of 61 students. These students were divided into three conditions: Condition 1 (N=12), Condition 2 (N=23), and Condition 3 (N=26), as described in the *Context* section. Participants were 45.4% Freshmen, 19.4% Sophomores, 24.6% Juniors, 9% Seniors, and 1.6% Other (one graduate student). Participants also reported an average of 2.97 years of work experience.

METHODOLOGY

Participants signed up through the Psychology Dept's online research participation system, for one 30 minute session and one 50 minute session approximately a week apart.

In the first session, participants were shown how to assemble half of a telephone kit by an experimenter. The telephone kit was divided into two halves, and at least 1 participant was familiar with each half for the second session. Afterwards, the participant was allotted 15 minutes to practice assembling the kit. Once the participant had completed the task, they were asked to fill out a feedback form about their performance, and were dismissed. For the second session, participants were divided into groups of 3 according to the following conditions:

1. Separate training, performance feedback to one individual
2. Separate training, performance feedback to the entire group
3. Separate training, no performance feedback

At the beginning of the second session, participants filled out Lewis' (2003) *TMS Scale*. Then performance feedback was distributed to the groups. Condition 1 teams had only one member who reviewed the feedback for 3 minutes. Condition 2 teams had 3 minutes to review the feedback as a group. Finally, Condition 3 teams had no feedback returned to them.

Participants were then given 30 minutes to assemble the entire telephone as a group. Afterwards, they again filled out Lewis' (2003) *TMS Scale*, were debriefed, and dismissed. The experimenter then scored the groups on time taken and any errors committed. Ratings from the first administration of Lewis' (2003) *TMS Scale* were also compared to ratings from the second administration.
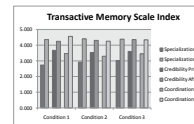
RESULTS

Assembly Time (seconds)
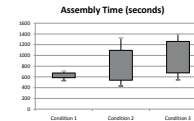
Assembly Time: Condition 1 completes much faster and with much less variability. Conditions 2 and 3 in the same range.
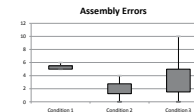
Assembly Errors

Assembly Errors: Condition 2 on demonstrates the least errors, while Condition 1 demonstrates the most. Condition 3 has a large variability.

Transactive Memory Scale Index

Ratings on Specialization, Credibility, and Coordination are higher after the teams perform the assembly task. In Condition 1, ratings on Specialization up 37%, ratings on Credibility up 13.6%, and ratings on Coordination up 24%. All other Conditions show similar improvements.

DISCUSSION & CONCLUSION

Contrary to our hypothesis, our study indicates that distributing performance feedback to one individual increases the total amount of errors committed, though on average leads to faster completion times. Distributing feedback to the entire group leads to a lower amount of errors committed and although taking longer, not significantly longer. This group performance feedback condition leads to the maximum desired outcome on tasks.

More research is called for on this topic as the growth in training costs often outpaces the growth of training budgets. Future research should investigate these effects on much more complex tasks that span more than one sitting.

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TRiO

OBJECTIVE

To determine whether an entire group must receive performance feedback, or if relaying the feedback to one person is enough to achieve satisfactory group performance and transactive memory formation.

Nadia Lima

Nadia Lima was born in Miami Florida of Cuban parents in 1988. She is currently pursuing her Bachelor's degree in Civil Engineering with a focus in Structural Engineering at Florida International University. After completing her Bachelor's degree, she plans to continue her current studies to obtain her Master's degree in Structural Engineering, followed by her Ph.D in the same field. Her areas of interest include concrete structures, steel design, cementitious materials, and foundation design. Nadia interned at Savannah River National Laboratory (SRNL) the summer of 2010. Her main task involved studying the cured properties of cellular grout for its use in in-situ decommissioning of the 105-P Reactor Disassembly Basin D & E Canal. Her honors and affiliations include being a DOE Fellow, McNair Fellow, member of Tau Beta Pi and Chi Epsilon Engineering Honors Society, and President of Theta Tau- Omega Gamma Chapter Professional Engineering Fraternity.

105-P REACTOR DISASSEMBLY BASIN D & E CANAL CELLULAR GROUT LABORATORY TESTING

ABSTRACT

The 105-P Reactor located at Savannah River National Laboratory (SRNL) at the Savannah River Site (SRS) in South Carolina is obsolete and no longer needed for production. The Department of Energy has set a goal to reduce its footprint at SRS, therefore identifying the 105-P Reactor for decommissioning. Part of the decommissioning process involves filling all below grade areas with cementitious materials; this is referred to as in-situ decommissioning. The 105-P Reactor Disassembly Basin D & E Canal is one of these below grade areas that are being filled with cementitious materials. The section that is to be filled is on top of an underlying chase; therefore, it is imperative to use a proper filling material to avoid collapsing the cavity. Cellular grout is the lead candidate for filling this space because of its light weight. Before filling in any sub-grade area, it is important to validate the material by conducting a series of tests. This technical report contains the results and conclusions of a series of cured tests including compressive strength, hydraulic conductivity, dry density, and moisture content.

CURED PROPERTY TESTING OF CELLULAR GROUT FOR THE USE IN IN-SITU DECOMMISSIONING OF THE 105-P REACTOR DISASSEMBLY BASIN D & E CANAL

Nadia Lima, Michael G. Serrato
Savannah River National Laboratory
Applied Research Center at Florida International University

BACKGROUND

The 105-P Reactor at Savannah River Site (SRS) has been obsolete since 1988. The Department of Energy has set a goal to reduce its footprint at SRS, therefore identifying the 105-P Reactor for decommissioning. Part of the decommissioning process involves filling all below grade areas with cemetious materials; this is referred to as in-situ decommissioning. A cross-sectional view of the Disassembly Basin D & E Canal to undergo decommissioning can be seen in Figure 3. The cavity itself cannot be filled due to the worker's safety issue of drilling through irradiated materials located above the concrete slab layer. Therefore, the area to be filled is the remaining space on top of the PR-UZB-FF grouted layer. Modified cellular grout is the desired material to be placed into this section. Since the section that is to be filled is on top of the underlying D & E Canal chase, it is imperative to use a proper filling material to avoid collapsing into the cavity. Cellular grout is the lead candidate for filling this space since it is known as a lightweight fill. Before using this material to fill the Disassembly Basin D & E Canal, it is essential to be able to test the cured properties of a specimen of cellular grout in order to validate the grout.

Figure 1: Cellular Grout is Less Dense Than Water

Figure 2: Density of Cellular Grout and Water

Figure 3: Area to Be Filled With Cellular Grout
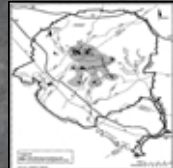
Figure 4: Savannah River Site

Figure 5: P-Reactor at Savannah River Site

METHODS AND EXPERIMENTAL SETUP

The following cured properties of the cellular grout were evaluated in agreement with ASTM testing standards:

- Dry Density
- Saturated Hydraulic Conductivity
- Compressive Strength
- Moisture Content

The grout mixture utilized can be seen in Table 1. A number of individual samples from the 6x12 inch test cylinder were prepared for testing purposes. The individual test samples were prepared as seen in Figure 6.

Figure 6: Sample Preparation

Table 1:
Cellular Grout per Yard Mix Design

Material	Quantity
Portland Cement Type I	695 lbs
Water	348 lbs (41 gallons)
VariMac Liquid Foam	17.9 cf

RESULTS AND CONCLUSIONS

Values attained are compared to literature values as seen in Table 2.

Dry Density: The lab result of 35.8 lb/ft^3 fit within the values obtained by National Bureau of Standards Data from "Insulating Concretes," ACI Journal (Nov. 1956) as well as ACI 523.1.

Hydraulic Conductivity: The specific gravity of the material is approximately 0.57 with respect to water. Since cellular grout is less dense than water, it took a few trials consisting of multiple hours at a time to achieve permeability in sample A. The attained value of 5.0×10^{-5} cm/s was close to the range given by ACI 523.1.

Compressive Strength: The compressive strength found in the lab was lower than the average compressive strength that the National Bureau of Standards Data reported. This can be due to many reasons, mainly the curing of the cellular grout cylinder. However, results were within the values attained by ACI 523.1. The specimens failed as seen in Figures 9 and 10. The types of fractures were found to be shear and columnar fractures. Shear fractures may occur due to the load being concentrated on one side more than another upon loading. Columnar fractures are common in specimens made from mortar or neat cement, as these specimens were.

Moisture Content: Since the grout mixture had a water/cement ratio of 0.50, moisture content as high as 23.6% after leaving the sample in the oven for 72 hours is not surprising.

Table 2:
Data Comparison

Test	Lab Value	ACI 523.1	Trip Report Value
Dry Density	35.8 lb/ft^3	up to 50 lb/ft^3	34-43 lb/ft^3
Saturated Hydraulic Conductivity	5×10^{-5} cm/s	1×10^{-6}–1×10^{-5} cm/s	N/A
Compressive Strength	278.4 psi, 315.2 psi	N/A	330-640 psi
Moisture Content	23.60%	N/A	N/A

ACKNOWLEDGEMENTS

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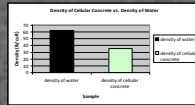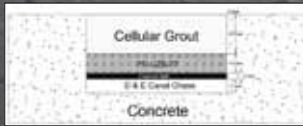
Figure 7: Sample Preparation

Figure 8: Saturated Hydraulic Conductivity

Figure 9: Fractured Larger Sample

Figure 10: Fractured Smaller Sample

OBJECTIVE

Test the cured properties of a specimen of cellular grout in order to validate the grout.

Francis Matthews

My name is Francis Matthews and I was born and raised in South Florida. I am currently majoring in Geosciences at Florida International University. I am graduating in December and have done multiple research projects dealing with the Everglades and other geology orientations. I am also an avid musician and plan to play professionally in the years to come. I am 23 years old and plan on attending graduate school within the near future, as well. My nationality is of Irish and Italian descent and I am trilingual. After graduating with a B.S. in Geosciences with a minor in Anthropology/Sociology, I plan to start a Ph.D. program concentrating in sedimentology/petrology. With this career path, I hope to work for a company that is developing alternative energy sources through fundamental earth forming processes. I am fairly optimistic in my approach to post-doctoral study and would prefer to work outdoors in the field environment, although I understand that not everything enjoyable is always appealing. No one in my immediate family has received a bachelor's degree and surely, no one in my family tree has received a graduate degree. I have taken the McNair challenge personally and most definitely want to be the first of many in my family to receive such an academic achievement.

MIOCENE FORAMINIFERAL BIOFACIES ALONG THE CARIBBEAN COAST OF NORTHWEST PANAMA

ABSTRACT

One of the last straits in Central America that connected tropical Atlantic and Pacific waters was through the Panama Canal Basin, central Panama. The strait was closed in the middle Miocene, as shown by terrestrial deposits of the underlying Cucaracha Formation (central Panama Canal Basin), and was reopened by late middle to late Miocene time when sediments of the lower Gatun Formation were deposited in the northern part of the basin. The Gatun Formation is informally divided into lower, middle and upper parts, and foraminifera from all parts have primarily Caribbean associations. Overlying the Gatun Formation is the uppermost Miocene Chagres Formation, the youngest formation of the Panama Canal Basin. Foraminifera from the type Chagres Formation have primarily Pacific associations.

New foraminiferal collections were made from outcrops previously mapped as either undifferentiated volcanics or Miocene lutites, silts and conglomerates. Analyses of similarity between the foraminifera and those from different facies of the Panama Canal and Bocas del Toro basins are used to identify changes in biofacies along the 180 km of Caribbean coast between the basins. Twenty-two inner-middle neritic benthic foraminiferal assemblages from the lower, middle and upper parts of the Gatun Formation, and twelve assemblages from the middle neritic Rio Indio section and outer neritic/upperbathyal type section of the Chagres Formation are compared statistically to the newly collected assemblages from the lowermost Gatun Formation (east of the Panama Canal), and the coastline between Gobea (west of the Panama Canal) and Bocas del Toro. The paleoenvironments and biogeographic associations of the foraminiferal biofacies are incorporated into reconstructions of the history of uplift and Atlantic-Pacific connections, and to infer formational boundaries.

MIOCENE FORAMINIFERAL BIOFACIES ALONG THE CARIBBEAN COAST OF NORTHWEST PANAMA

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McNair Fellowship

ABSTRACT

One of the last straits in Central America that connected tropical Atlantic and Pacific waters was through the Panama Canal Basin, central Panama. The strait was closed in the middle Miocene, as shown by terrestrial deposits of the underlying Cucaracha Formation (central Panama Canal Basin), and was reopened by late middle to late Miocene time when sediments of the lower Gatun Formation were deposited in the northern part of the basin. The Gatun Formation is informally divided into lower, middle and upper parts, and foraminifera from all parts have primarily Caribbean associations. Overlying the Gatun Formation is the uppermost Miocene Chagres Formation, the youngest formation of the Panama Canal Basin. Foraminifera from the type Chagres Formation have primarily Pacific associations.

New foraminiferal collections were made from outcrops previously mapped as either undifferentiated volcanics or Miocene lutites, silts and conglomerates. Analyses of similarity between the foraminifera and those from different facies of the Panama Canal and Bocas del Toro basins are used to identify changes in biofacies along the 180 km of Caribbean coast between the basins. Twenty-two newly collected benthic foraminiferal assemblages from the lower, middle and upper parts of the Gatun Formation, and twelve assemblages from the middle neritic Rio Indio section and outer neritic/upperbathyal type section of the Chagres Formation are compared statistically to the newly collected assemblages from the lowermost Gatun Formation (east of the Panama Canal), and from the type Chagres Formation that crops out west of the Panama Canal. The paleoenvironments and biogeographic associations of the foraminiferal biofacies are incorporated into reconstructions of the history of uplift and Atlantic-Pacific connections, and to infer formational boundaries.

Figure 1. Map of Panama, adapted from http://www.geographicguide.net/america/panama. Study area is along north coast within box. See Figure 4 for sampling localities.

INTRODUCTION

In middle to late Miocene time, marine waters covered the area along the present-day northwest coast of Panama, and sediments of the Middle – Upper Miocene Gatun Formation and Upper Miocene Chagres Formation were deposited. Earlier research (Woodring, 1957) on this region's fossil mollusks defined the lower, middle and upper parts of the Gatun Formation, and produced a geologic map (Figure 2) with crystalline basement rocks west of the canal area, although collecting along the coast in the 1980s (Coates et al., 1992) discovered probable Cenozoic sediments. Previous research (Figure 3; Collins et al., 1996) defined some of the major facies of the Chagres Formation in the area closest to the Panama Canal: Sediments of the Rio Indio facies of the Chagres Formation were deposited at ~75 m water depth, and the type Chagres was upper bathyal, ~ 200 m. The purpose of this study is to describe the main facies of the underlying Gatun Formation, which crops out on either side of the Panama Canal, relate these facies to those of the Chagres Formation that crops out west of the canal, and to extend the original study westward toward the Valiente Peninsula, Bocas del Toro (Collins, 1993).

The paleoenvironments of the Gatun and Chagres formations are interpreted from the assemblages of benthic foraminifers contained in their sediments. Benthic foraminifera are found in nearly all marine-influenced sediments and are generally bathymetrically zoned, i.e., species live under certain marine conditions that correspond generally to a range of water depths. Thus, from an assemblage of 50 – 100 species, most of which are living today, we can interpret a paleobathymetry that is constrained by many independent sources of information. Previously studied samples (Collins et al., 1996) from near the Panama Canal were combined with newly collected samples from west of that region to ascertain whether the western facies were similar to those of the Panama Canal, or from different facies and formations.
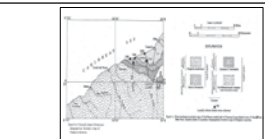

Figure 2. Geologic map of Woodring (1957) showing predicted formations along the northwester coast of Panama west of the Panama Canal.

Figure 3. Locality map of samples with formations, northwestern coast of Panama west of the Panama Canal. Adapted from Collins et al. (1996).

Figure 4. Topographic map of Panama (inset of Fig. 1) with sample locations near the Panama Canal and along the northwest coast.

METHODS

New samples of sediments from west of the Panama Canal area were collected by O'dea (AT samples) and Collins (LC samples), and compared to previously collected (PPP) samples. Sediments were placed in a sturdy plastic bag and hammered to obtain small chunks. Approximately 50-g portions were extracted and soaked in deionized water for two-three days to disaggregate the clays. After particles were disaggregated, they were washed through a 63-µm sieve to retain sand-sized sediments, and filtered through paper filters to drain the excess water. Then, the filtered samples were left under a fume-hood overnight to dry. Dry samples were stored in labeled vials.
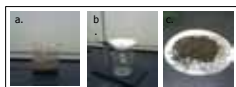

Figure 5. a. Sample soaking in deionized water. b. Residue collected in filter paper. c. Drying sample

The dried residues were examined for their foraminiferal content . Each sample was sprinkled onto a sediment tray and observed under a light microscope. If a sample was barren of microfossils it was discarded. If specimens were still covered with mud, the samples were placed in beakers and covered with paint thinner overnight. The paint thinner was drained from the samples using a filter paper and the remaining sample was covered with a mixture of water and a tablespoon of washing soda (to buffer the calcite tests). The samples were simmered without boiling on a hot plate for two-three hours, then washed, filtered and stored in labeled vials.

Sediment samples with sparse to abundant foraminifera were split using an MS-1 microsplitter to obtain at least 300-400 individuals, a number that on average yields statistically significant species proportions. After picking the individuals from the sediments and placing them on slides, they were sorted by species and identified.

Percentages of abundant benthic foraminifera per sample were used in cluster analysis to determine variation of species assemblages among chosen sections. To study the assemblages of each section, the number of individuals of each species was divided by the total number/ sample to calculate specimen percentages of each faunal slide. A multivariable statistical software application SYSTAT, v. 11 (2004) was used to run the cluster analysis. Species with numbers of individuals of $\geq$ 1% in any one sample were transformed from percentage data using the relationship 2 arcsin $\sqrt{P}$, where P= percentage datum (Collins, 1993). Calculation of z values in the equation standardized the species variability and also equalized the percentage of each species to approximate a multivariate normal distribution of the data.

RESULTS

Hierarchical cluster analysis of the benthic foraminiferal assemblage data showed which samples were most similar in biofacies. The method joins the two most closely related samples, and then the next two most similar samples or clusters, and this is repeated progressively until all samples are clustered. Six different algorithms (SYSTAT, 2004) were used to calculate the distances between samples or clusters of samples. The results of the cluster analysis calculated with Ward's Algorithm are shown below (Figure 6), because although the results of the other algorithms are similar, the other algorithms joined samples one-at-a-time rather than grouping them, which produced long, stringy clusters that are more difficult to interpret because the patterns are less obvious. The main patterns are described in Figure 6.
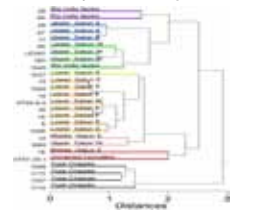

Figure 6. Cluster analysis of 26 benthic foraminiferal assemblages, Ward's algorithm. All samples are from the Panama Paleontology Project (PPP) unless labeled AT or LC. Samples from units and facies within formations are grouped fairly well, as follows:

- The **type Chagres Formation** deepwater (upper bathyal) samples (black lines) are distinctly different from all others.

- The **lower Gatun** samples (orange) are the most closely related to each other, forming a cluster.

- The **middle Gatun** sample PPP19 (pink) is most similar to upper Gatun sample PPP1660, but then joins with the lower Gatun cluster.

- The other **middle Gatun** sample PPP18 (red) is unusual for the Gatun Formation in having moderately abundant carbonate-associated taxa, and is thus joined with the other sample AT07-29-1 having a rich carbonate-associated component.

- The **upper Gatun** east of the Panama Canal (blue) is distinctly different from that west of the canal (green). The west contains more *Uvigerina peregrina* gp. and *Hanzawaia concentrica*, and fewer *Cassidulina* and *Pararotalia* than the east. However, east and west upper Gatun are most similar to each other.

- The **Rio Indio facies, Chagres Formation** (purple, green) cluster with upper Gatun samples from west of the Panama Canal, nearest to their localities.
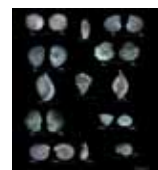

Plate 1. Benthic foraminifera from the Culebra Formation. 1. *Amphistegina gibbosa*, sample AT07-32-1. 2. *Bolivina tongi*, sample LC 510. 3. *Elphidium discoidale*, sample AT07-29-1. 4. *Nonionella atlantica*, AT07-29-1. 5. *Pararotalia magdalenensis*, sample AT07-29-1. 6. *Spiroloculina*, sample AT07-32-1. 7. *Bolivina subaenariensis mexicana*, sample LC 510. 8. *Spiroloculina* sp., sample AT07-32-7. 9. *Cancris sagra*, sample LC 510. 10. *Glabratella*, sample AT07-29-1. 11. *Cornuspira*, sample AT07-32-1. 12. *Cassidulina subglobosa*, sample LC 510.

CONCLUSIONS

- The upper Gatun Formation west of the Panama Canal is similar to the Rio Indio facies of the overlying Chagres Formation, suggesting that the upper Gatun west is probably younger than the upper Gatun east.

- The upper Gatun samples are more diverse with abundant *Uvigerina peregrina* compared with the lower Gatun that is rich in *Nonionella atlantica*, *Elphidium* spp. and *Bolivina vaughani*, suggesting a deeper and more open-ocean influence for the upper Gatun. They are both within 25 – 50 m paleobathymetry.

- The facies of the Gatun east of Miguel de la Borda to Gobea (Figure 3) is upper Gatun, which extends the upper Gatun a bit more eastward of where its boundary with the Rio Indio facies was previously placed (Collins et al. 1996).

- The formations are extended westward as follows: The grouping of sample AT05-3-3 with the lower Gatun facies (with all cluster algorithms) clearly shows the extent of the Gatun Formation at least 110 km west of Miguel de la Borda. However, within 25 km to the west of sample AT05-3-3, the facies changes to a new, unnamed formation (represented by sample AT07-29-1) that is much richer in carbonate, more similar to the Pliocene formations of Bocas del Toro (Collins, 1993).

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OBJECTIVE

Miocene foraminiferal biofacies of the NW coast of Panama.

Camilo Mohar

I started FIU in August 2005 after graduating magna cum laude from Southwest Miami High School. When I decided to pursue a career in biomedical sciences, my family cannot have shown more support. Being the first to receive a bachelor in my family, receiving the McNair Fellowship was the second zenith of my academic career next to graduation. With this prestigious fellowship I got the opportunity to explore my academic interest in biomedical research and was offered the chance to visit the University of Notre Dame and experience how students work in their MD, PhD program with Indiana University School of Medicine. There I performed some work satisfying my interest in cancer research and developmental biology. Since then, I have accomplished much and have acquired my bachelor in Biological Sciences. Coming from a Cuban family where the only thing more important than baseball and cigars is education,

achieving this has been paramount in my home. Thanks to McNair I have been able to expand and implement my experiences along with my academics to pursue a career in medicine. I am even glad to say that thanks to these achievements I have been invited to present my work in the Annual Biomedical Conference for Minority Students in Charlotte, North Carolina in November due to this Post baccalaureate Program. I hope, in the future, I may return to the McNair office in FIU and serve as an example to other cohorts in my success and provide some sort of mentorship to students following my path. Until then, I serve as an example to my siblings and lay wait for my graduate studies to begin. If I could say anything else I would like to say that I am who I am, I do what I do, and have gotten to where I am now thanks to the grace of God and the support of family.

OVEREXPRESSION OF P190B RHOGAP IN VIVO ALTERS EXPRESSION LEVELS OF MITOTIC GENES INVOLVED WITH CHROMOSOMAL INSTABILITY

Camilo Miguel Mohar[1,2], Peter McHenry[1,2], Tracy Vargo-Gogola[1,2]

Over 70% of breast cancers are diagnosed as invasive ductal carcinomas showing a high degree of aneuploidy. Aneuploidy results from chromosomal instability (CIN), unfaithful segregation of DNA during cell division. The most consistent characteristic of tumors is CIN and the Rho signaling network is known to be altered in breast cancer. Cell Rho signaling is pertinent in mitosis suggesting that its disruption may cause CIN. An important regulator of the Rho signaling network is p190B Rho GTPase activating protein (GAP). The importance of p190B is observed in mammary gland development especially during ductal morphogenesis. Overexpression of p190B increases mammary tumor formation in onco genetic mice models of breast cancer. P190B RhoGAP has also been observed to localize in mitotic structures such as the centrosomes and kinetochores in MCF-7 cells. We hypothesize that overexpression 190B RhoGAP is involved in CIN. Preliminary studies have already suggested that inducible overexpression of p190B in MCF-7 breast cancer cells have shown mitotic abnormalities that could lead to aneuploidy and CIN. Carter SL, et al, identified a "CIN signature" list of genes that are common in poor clinical outcomes of various cancer particularly breast cancer. This list contained over 70 genes, and interestingly, 29 of these genes are involved in mitosis. A preliminary experiment involving a microarray analysis of p190B overexpressing mammary epithelial cells indicated that a number of mitotic genes, including genes implicated in CIN, are altered by p190B overexpression. From this analysis, a list of 31 genes that were most consistently altered via p190B overexpression and associated with mitosis/CIN was generated.

ABSTRACT

[1]Walther Cancer Research Center/Department of Biological Sciences, University of Notre Dame,
[2]Department of Biochemistry and Molecular Biology, Indiana University School of Medicine

Overexpression of p190B RhoGAP Alters Expression Levels of Mitotic Genes Involved With Chromosomal Instability.

Camilo Miguel Mohar[1], Peter McHenry[2,3], Tracy Vargo-Gogola[2,3]

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[3]Department of Biochemistry and Molecular Biology, Indiana University School of Medicine, South Bend, IN 46617.

Abstract

Over 70% of breast cancers are diagnosed as invasive ductal carcinomas, which show a high degree of aneuploidy. Aneuploidy results from chromosomal instability (CIN), unfaithful segregation of DNA during cell division. Rho signaling is altered in breast cancer and has been implicated in mitosis suggesting that its disruption may cause CIN. P190B RhoGAP is an important regulator of the Rho signaling network in mammary gland development and promotes mammary tumor formation and metastasis. A list of genes that are common in CIN and predict poor clinical outcome in breast cancer have been designated as "CIN signature gene"(Carter et al 2006 Nature Genetics). The goal of the current study was to validate changes in expression of these genes using Q-PCR. We found that genes Zwint and Prc1were overexpressed 1.8 and 1.3 fold, respectively, in p190B OE mice with comparison to controls. Although other genes such as Aurkb (Aurora B)and Survivin (Birc5) showed a trend of up-regulation, statistical significance was not accessible with our limited samples. Merotelic kinetochore-microtubule attachments, implicated as a mechanism of CIN, may be promoted by p190B OE due to the alteration of Zwint, PRC1, Birc5, and Aurora B gene expression. This study has provided evidence that p190B OE can cause alterations in gene expression particularly genes associated with CIN and breast cancer.

Introduction

Mouse mammary ductal morphogenesis begins during puberty, at about 3 weeks after birth and lasts up to 9 weeks of age. P190B RhoGAP expression is high during ductal morphogenesis especially in highly replicative structures called (TEB) terminal end buds (Fig.1). Overexpression (OE) of p190B has been shown to cause hyperplastic lesions emphasizing its importance in mammary gland development and perhaps tumorgenicity. The Rho signaling pathway is altered in most breast cancer patients. Of the many Rho proteins known to exist in cells, the most studied are Rho, Rac1, and Cdc42 GTPases. These proteins cycle between the active GTP bound state and the inactive GDP bound state with the aid of RhoGEFs and RhoGAPs, respectively (Fig. 2).

Fig. 1 (A)- Shows a mammary gland of normal developing female mouse. (B)- Depicts a terminal end bud and its surrounding tissue.
Fig. 2- Illustrates the basic role of the Rho Signaling Cascade and its many functions within cell physiology.

Investigations are focusing on chromosomal instability (CIN) because it is the most consistent characteristic of tumors. A set of genes associated with CIN referred to as "CIN signature" genes have been linked to several cancers including breast cancer. This list included about 70 genes that were linked to CIN and defined poor prognosis as an increase in metastases and malignant potential. With p190B RhoGAP shown to be involved with cell mitosis and cytokinesis among MCF-7 cells (Fig. 3) derives the question, is p190B involved in CIN? Preliminary experiments have shown that an inducible overexpression of p190B in MCF-7 cells produces centrosome abnormalities, multipolar spindles and multinucleation, confirming p190B's role in mitosis that warrants further investigation.
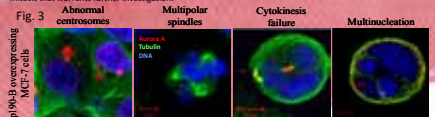

Fig. 3 OE of p190B MCF-7 cells showing abnormalities while undergoing mitosis.

Methods

MECs were isolated from developing mouse mammary glands at six weeks of age following seven days of treatment with doxycycline for 5 days to induce transgene expression. RNA was isolated via TRIzol method and purified via Qiagen RNeasy Kit. RNA was then converted to cDNA via reverse transcriptase from Applied Biosciences and primers were either ordered from Harvard Primer Bank or designed de novo according to specificity of gene studied. SYBR green with ROX internal standard (SA Biosciences) was used as dye for Q-PCR and Applied Biosciences StepOnePlus Real-Time PCR Systems was used to supply raw data with Gapdh as our house keeping gene. $2^{-\Delta\Delta CT}$ method was performed to calculate data and statistics was used to find significance and trends of p190B OE effect.

Results

Table 1-The list of mammary epithelial cell (MEC) genes that were determined to be the most consistently altered in the microarray distinguished as CIN signature genes on the left and mitotic genes affected by p190B OE on right.
Table 2-The results of all the genes analyzed with statistical relevance, from isolated MECs, using the $2^{-\Delta\Delta CT}$ method for comparison.
Graph 1-A graph Illustrating Prc1, and Zwint statistically significant overexpression and Aurora B, and Survivin (Birc5) overexpression trend in p190B OE MECs (blue) compared to control group (red).
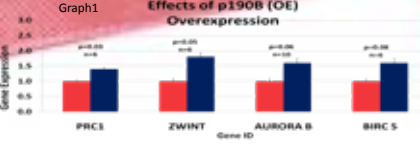
Conclusions

• During ductal morphogenesis p190B overexpression (OE) in vivo alters significantly CIN signature genes Prc1, and Zwint.
• Other genes that show an alteration of gene expression with p190B OE are Aurora B, and Survivin (Birc5).
• P190B may directly or indirectly cause chromosomal instability (CIN) through interaction with prc1, zwint, aurora B, and birc5.
• QPCR data compliments experiments done on OE p190B MCF-7 cells in support of its potential mitotic abnormalities such as multi-polar spindles, and multi-nucleation.
• Gene expression via QPCR showed substantial animal to animal variability as did the microarray analysis however Prc1 and Zwint are distinguishably expressed 1.3 and 1.8 respectively in the experimental group to logically deduce their role with p190B OE and CIN.
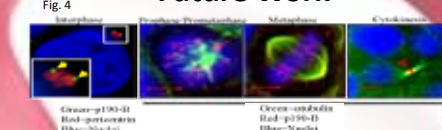
Future Work

Fig. 4 Endogenous p190B is observed to be localized at the centrosomes, kinetochores, and midbody during mitosis.

Proteins prc1, aurora B, and birc5 have shown to work in correcting merotelic attachments, a common abnormality that leads to chromosome missegregation and potentially aneuploidy. Interestingly, p190B RhoGAP was found to localize in at the centromeres, kinetochores, and cell midbody during mitosis in the MCF-7 study (Fig. 4). Protein birc5 has been reported to be very important in the chromosome passenger complex (CPC). This is relevant because CPC consists of birc5, aurora b, borealin, and incenp, which together regulate proper chromosome alignment by fixing faulty chromosome-spindle interactions. These CPCs gather at the centromeres during prometaphase and disruption of CPCs have shown to cause spindle checkpoint impairment. This compliments the MCF-7 cells observation with our data reporting alterations in genes Birc5, and Aurora B. We can deduce that p190B may have some function with CPCs during mitosis that begs for further investigation. Further studies such as immunofluorescent stainings, Western blots, phosphorylation statuses, and immunoprecipitation will be conducted in the near future. This will give insight on our speculation and observe the protein-protein interactions that we need, for further understanding of p190B role in MEC and its CIN inducebility.

Acknowledgments

OBJECTIVE

Overexpression of p190B RhoGAP alters expression levels of mitotic genes involved with chromosomal instability.

Alexander Moncion

My name is Alex Moncion, and I am currently a senior majoring in physics. I was born in the Dominican Republic and migrated to the United States at the age of 6, and ever since then I have lived in South Florida. I have many siblings, ten in total, from my mother and father. I am the youngest of all and the first and only in the family to reach a college level education. I entered Florida International University as a transfer student from Miami Dade College. I currently do research in the Chemistry department under the guidance of Dr. John Landrum with respect to carotenoid aggregation. I am interested in medicine and thoroughly enjoy natural science. For my graduate studies I would like to work in these two fields, and I believe medical physics is the ideal field of study for me. My ultimate goal is to acquire a MD/Ph.D. degree in Molecular and Cellular Pharmacology with hopes of using an extensive background in chemistry and medicine to synthesize medication and develop chemical mechanisms that will aim at curing diseases and not just treating them. Being a McNair Fellow gave me the opportunity to network with people who are dedicated and believe that success relies more on hard work than solely on intelligence. My goal is to develop new methods to save lives without endangering the people I am trying to serve.

MEASUREMENT OF THE 12C+12C FUSION CROSS SECTION AT SUB-BARRIER ENERGIES

ABSTRACT

My name is Alex Moncion, and I am currently a senior majoring in physics. I was born in the Dominican Republic and migrated to the United States at the age of 6, and ever since then I have lived in South Florida. I have many siblings, ten in total, from my mother and father. I am the youngest of all and the first and only in the family to reach a college level education. I entered Florida International University as a transfer student from Miami Dade College. I currently do research in the Chemistry department under the guidance of Dr. John Landrum with respect to carotenoid aggregation. I am interested in medicine and thoroughly enjoy natural science. For my graduate studies I would like to work in these two fields, and I believe medical physics is the ideal field of study for me. My ultimate goal is to acquire a MD/Ph.D. degree in Molecular and Cellular Pharmacology with hopes of using an extensive background in chemistry and medicine to synthesize medication and develop chemical mechanisms that will aim at curing diseases and not just treating them. Being a McNair Fellow gave me the opportunity to network with people who are dedicated and believe that success relies more on hard work than solely on intelligence. My goal is to develop new methods to save lives without endangering the people I am trying to serve.

Measurement of the $^{12}C+^{12}C$ Fusion Cross Section at Sub-Barrier Energies

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Department of Physics, University of Notre Dame, Notre Dame, Indiana 46556

Abstract

The goal of nuclear astrophysics is to understand the nuclear processes which power the stars and synthesize heavier elements. One important nuclear process is the $^{12}C+^{12}C$ fusion occurring in massive stars. The $^{12}C+^{12}C$ fusion produces ^{24}Mg which can decay to ^{20}Ne or ^{23}Na via particle evaporation, shown in Fig. 1. Most of the residues may emit gamma radiation that can be detected using a gamma detector. We have studied the $^{12}C+^{12}C$ fusion reaction within the center of mass energy range of 4.1 MeV to 6.5 MeV by detecting the 440 keV and 1634 keV gamma lines using a germanium detector. The total fusion reaction cross section is determined after correcting decay branching ratios and summing effect.

Introduction

The $^{12}C+^{12}C$ fusion reaction occurs in massive stars several times the size of the Sun. The main products of the carbon fusion reaction are ^{20}Ne through the alpha channel $^{12}C(^{12}C,\alpha)^{20}Ne$ reaction, ^{23}Na through the proton channel $^{12}C(^{12}C,p)^{23}Na$ reaction, and ^{24}Mg through the neutron channel $^{12}C(^{12}C,n)^{23}Mg$ reaction[2]. However, limited by time, our studies focus solely on the proton channel. In order to determine the reaction probability at a given energy, we detect the gamma radiation, emitted as a byproduct of the alpha, proton, and neutron channels, with a germanium gamma particle detector. Each channel emit gamma particles of particular energies, and depending on the excitation energy of the produced fusion residue we can deduce the identity of the reaction product and predict the likelihood (cross section) of the $^{12}C+^{12}C$ reaction occurring. Initially, ^{24}Mg is produced from the $^{12}C+^{12}C$ reaction, and that further decays via alpha, proton, or neutron channels. There are various excited states that the fusion residues may decay to, and some of those excited states may branch into several gamma channels. Each with their own probability of gamma emission. Aside from that, cascading decays may sum together, while being detected, and interfere the detection of certain gamma rays. With our current equipment we focus on the two gamma rays, 440 keV and 1634 keV gammas, which are emitted from the first excited states of the fusion residues, ^{23}Na and ^{20}Ne, respectively. Therefore, in order to accurately calculate the cross section of the $^{12}C+^{12}C$ reaction we must correct for decay branching and the summing effect that occurs from the time span of the decay of the parent nuclei to the detection of the gamma particle.

Experimental Method

Efficiency Calibration

We initially determined the relative efficiency of our germanium detector using a ^{56}Co source. The relative efficiency provides a method of comparing the detector's efficiency at various energies. The absolute peak efficiency was acquired using three radioactive sources with high decay intensity and known radioactive activity, ^{60}Co, ^{22}Na, and ^{137}Cs. The total number of counts for the major peaks produced by the decay of these sources was acquired and compared to the source's current decay rate. We then fit the relative efficiency to these points and acquired equation 1, where x represents ln(Energy) in keV.

$$\varepsilon_{Peak} = -0.00174x^2 - 0.87195x + 4.224 \qquad (1)$$

Branching and Summing Effect Correction

When correcting for branching we must account for the probability of the nuclei decaying at a particular proton channel, ranging from p0 to p10. Once the nuclei has decayed to a certain proton channel, that channel may contain further branching that must also be accounted for. Some excited states may have a cascading decay, a decay mode that emits more than one gamma before reaching the ground state. Summing may occur in which two separate gamma particles interact with the detector simultaneously. The detector may record these two separate interactions as a single entity, which leads to error in counting the number of peak and total counts. In order to detect 440 keV gamma rays, we must miss every single gamma particle emitted by the source while the 440 keV gamma is being detected. We can correct for summing by subtracting the gamma particles emitted by the source that are not 440 keV and implementing this into the same equation used to correct for branching. This is expressed in the following set of equations.

$$\sigma_{i,440} = \sigma_1 B_1 \eta_{P440} \qquad (2)$$

where σ_i is the partial cross section of the parent nuclei, ^{24}Mg, decaying to a specific excited state of ^{23}Na after evaporating a proton, B_1 represents the branching ratio of the gamma that cascades to the 440 keV gamma, η_{P440} is the peak efficiency of the 440 keV gamma, and η_{T_y} is the total efficiency of each proton channel using each channel's specified equation. This yields the actual observable cross section of 440 keV gamma emitted from a particular proton channel and then detected by a Ge detector, $\sigma_{i,440}$.

Calculating Cross Section

The $^{12}C+^{12}C$ fusion reaction has been measured in a energy range of 4.1 MeV to 6.5 MeV in the center of mass frame using the $^{12}C^{2+}$ beam from the FN tandem accelerator at University of Notre Dame. The beam intensity is below 500 µA. A 20 µg/cm² C foil is used as a target. Two Faraday cups are placed before and after the target to measure the change of the charge state. The gamma rays from the reaction is detected by a Ge detector placed at 90 with respect to the beam direction to minimize the Doppler shift effect. The fusion cross section for the proton channel can be determined using equation 3.

$$\sigma_p = \frac{N_{440}}{\varepsilon_{440} C_{440}} \frac{1}{N_{beam} N_x} \qquad (3)$$

where N_{440} depicts the number of 440 keV gamma recorded by our detector, ε_{440} is the absolute efficiency at the 440 keV peak, C_{440} is the correction factor which is ratio of the observed 440keV cross section and the actual fusion cross section for the proton channel as shown in Eq. 2. The particle fusion cross section used in the calculation is taken from [3]. In Equation 3, N_{beam} is the total number of incident ^{12}C beam particle, and N_x is the aerial density of the of the target in particles per millibarn.

Results

Our results, labeled "REU", are compared with those of Aguilera[4], High[5], Patterson[6], Becker[3], and Mazaraki[7] in Figure 2.
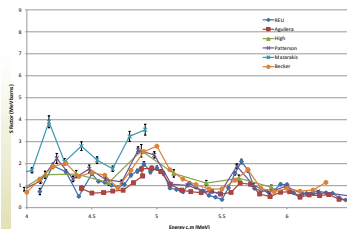

Figure 2: Modified S factor (see [1] for definition) for the proton channel from various experimenters between 4 and 6.5 MeV in the center of mass frame.

As you can see the data converges from about 5.3 to 6.5 MeV$_{c.m}$, however there is discrepancy from 5.3 MeV$_{c.m}$ to lower energies. This may be due to different target thickness and large energy shifts between the different experimenters as depicted by Barnes, Trentalange, and Wu[8]. The error of the beam particle is estimated as 5%. However, the target density is based on the number provided by the supplier. It needs to be checked with an independent measurement, such as measuring alpha energy loss in the carbon foil. Branching and summing effects must always be corrected since it is dependent on the detector used. It is widely known that larger detectors seem to have a greater summing effect due to their greater exposure area. The dependence of the correction factor on the Ge detection efficiency is investigated using a Geant4 simulation. We noticed an inverse relation between the detector efficiency and corrected partial cross section. This is shown in Figure 3.
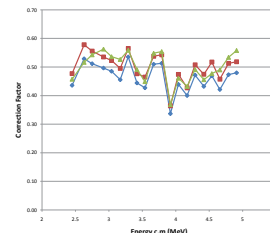

Figure 3: Correction factor based on simulations of three different Ge detectors with 0.1%, 1% and 4% peak efficiency at 440 keV respectively.

For future experiments, an experimental standard should be placed. For the sub-barrier fusion reaction, because the cross section is very sensitive to energy, a careful beam energy calibration is required. The target thickness is also crucial for the yield determination as well as the effective beam energy. Because of carbon build up problems, the target thickness is a function of integrated dose of the beam particle. In the future experiment, the target thickness needs to be monitored with elastically scattered beam particle. A complimentary thick target measurement is useful.

Acknowledgements

Sources

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OBJECTIVE

In order to determine the reaction probability at a given energy, we detect the gamma radiation emitted as a byproduct of the alpha, proton, and neutron channels with a germanium particle detector.

Alvaro A. Quinonez

Alvaro Quinonez was born in New Jersey, U.S.A, and is of Colombian heritage. When he was younger, he lived in Colombia for four years. He then moved back to New Jersey, and then Miami. He has lived in Miami for about 12 years. He is a graduate of Coral Reef Senior High School. Upon graduating high school, Alvaro enrolled at Florida International University, deciding to study civil engineering because of his fascination with structural engineering.

In addition to studying civil engineering, Alvaro is also a student in FIU's Honors College. Furthermore, Alvaro is a member of Chi Epsilon – The National Civil Engineering Honor Society. During the spring semester of 2009, he served as the Secretary/Treasurer of the society's FIU chapter, and in the fall semester he was the chapter President. In 2010, Alvaro was chosen as a McNair Fellow by the Ronald E. McNair Postbaccalaureate Achievement Program at FIU.

In 2007, Alvaro worked at the National Science Foundation (NSF) with the program director of the Network for Earthquake Engineering Simulation (NEES). In 2008 and 2009, Alvaro worked as an Undergraduate Research Assistant at FIU's Laboratory for Wind Engineering Research. At the laboratory's Wall of Wind facility, capable of subjecting full-scale building models to hurricane winds and wind-driven rain, Alvaro assisted graduate students in preparing experiments. In the summer of 2009 and 2010, Alvaro was part of the Massachusetts Institute of Technology Summer Research Program. During both summers, Alvaro worked on analyzing the stability of unreinforced masonry structures. In one of the studies, Alvaro and the research team he formed a part of used a novel method for generating small-scale structural models of masonry structures. From this study, Alvaro and the team published a paper titled Small-Scale Models for Testing Masonry Structures, of which he is the first author. He presented this paper at the 7th International Conference on Structural Analysis of Historic Constructions, held in October 2010 in Shanghai, China. Alvaro also presented some of the research he helped conduct at MIT at FIU's 7th Annual Ronald E. McNair Scientific Research Symposium. At the symposium, Alvaro was awarded first place presentation and second place poster. Alvaro's future plans are to obtain Master of Science and PhD degrees in structural engineering. After graduate school, he wants to continue his research and consult in industry.

PHYSICAL MODELING OF CURVING MASONRY STRUCTURES

Experiments on small-scale brick models are used to investigate the lateral stability of unreinforced curving masonry walls. Understanding the mechanics of curving walls will advance the knowledge of the stability of historic masonry structures, enabling engineers to accurately assess their safety. Five geometries are studied to observe the effect of curvature on wall stability. Small-scale models are manually constructed using clay bricks measuring 54x27x14mm. The walls are tilted on an inclining platform until collapse occurs. Tests are recorded using a high-speed video camera to capture the collapse mechanisms. Results demonstrate that wall stability increases with the amount of curvature, and that collapse mechanisms are caused by hinge lines forming due to a combination of brick rotation and sliding. Such experiments provide invaluable observations of collapse mechanisms, which can be compared to theoretical predictions and numerical models. Construction issues presented by brick imperfections and the construction method are also discussed.

ABSTRACT

Physical Modeling of Curving Masonry Structures
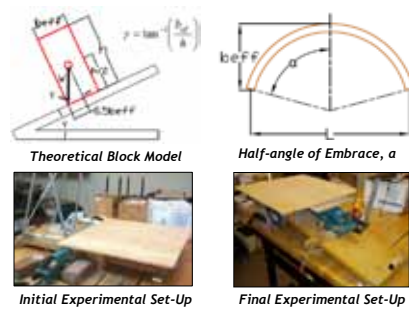
Alvaro Quiñonez
aquin011@fiu.edu

Mentor: Professor John Ochsendorf
Supervisor: Jennifer Furstenau

Building Technology Lab
Massachusetts Institute of Technology

Abstract

Small-scale masonry wall models are used to study the lateral stability of curving unreinforced masonry walls. Understanding the mechanics of curving wall geometries advances the knowledge of the stability of historic masonry structures, enabling accurate assessments of their safety. Five geometries are studied to observe the effect of curvature on wall stability. Models are manually constructed using clay bricks measuring 54x27x14mm, and tilted on an inclining platform until collapse occurs. Tests are recorded on high-speed video to capture the collapse mechanisms. Experimental results reveal that wall stability increases with curvature, and that collapse mechanisms are caused by hinge lines forming due to a combination of brick rotation and sliding. Such experiments provide invaluable observations of collapse mechanisms, which can be compared to theoretical predictions and numerical models. Construction issues presented by brick imperfections and the construction method are also discussed.

Why Curving Masonry Walls?

•No engineering studies

Serpentine Wall, Maryland, U.S.A. (Harmon)

Serpentine Wall at UVa (Virginia)

Jefferson: Curving Walls vs. Plane Walls with Piers (Columbia)

Small-Scale Structural Models

•Theoretical model based on rigid block
•Wall geometry based on α
•Wall dimensions
　•Scale 1 - 32 x 23 cm (h/L = 72%)
　•Scale 2 - 45 x 36 cm (h/L = 80%)
　•Case Study - 60 x 24 cm

Theoretical Block Model

Half-angle of Embrace, α

Initial Experimental Set-Up

Final Experimental Set-Up

Scale 1 - 0°, ±30°, ±60°

Scale 2 - 30°, 60°

Number of Bricks Used in Scale 1 & 2 Models

	Wall Geometry	No. of Bricks
Scale 1	0°	96
	±30°	96
	±60°	112
Scale 2	30°	225
	60°	250

Collapse Sequence of 60° Wall (Scale 2)

Case Study of Walls: Serpentine, Straight + Piers, Straight

Number of Bricks Used in Case Study Models

	Wall Geometry	No. of Bricks
Case Study	Serpentine	187
	Straight + Piers	323
	Straight	187

Results

Tilt Angle at Collapse (h/L = 72%)

Tilt Angle at Collapse (h/L = 80%)
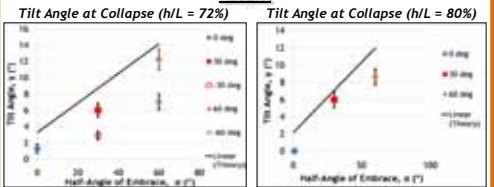
Case Study of Jefferson's Serpentine Wall

Wall Geometry	Tilt Angle (°)	Increase in Lateral Stability	Material Efficiency
Straight	1.6	--	1
Straight + Piers	4.5	181 %	1.6
Serpentine	4.1	156 %	2.6

Conclusions & Future Work

•Small-scale structural models are advantageous
•Curvature increases lateral stability of walls
•Serpentine walls have high material efficiency
•Variation in brick geometry affected model construction
•Future work
　•DEM models – Defining joint parameters

References

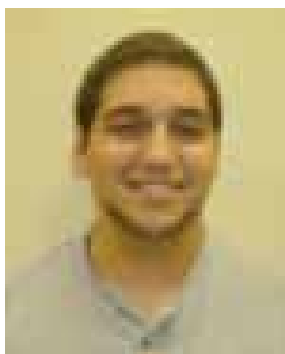1. Bearing Walls: Monolithic Masonry Construction [Online]. Columbia University.
2. [Online] Computer Science. University of Virginia
3. Serpentine Wall [Online]. Mount Harmon Plantation.

OBJECTIVE

Study the lateral stability of curving unreinforced masonry walls using small-scale masonry wall models.

Rigoberto J. Roche

From a young age I developed an interest for mathematics and sciences. Despite the fact that I was born in a small town, called Santa Clara in Cuba, with very limited resources, I was always borrowing the old Russian math books from the local library and reading them at my own pace. Unfortunately, my severe visual problems have always been an obstacle in my life. I suffer from a very advanced myopia, astigmatism and worst of all, rotatory nystagmus. This visual impediment makes it difficult for me to read for prolonged periods of time. However, through the study of Tai Chi I have been able to control my eye jitters. My father introduced me into the world of martial arts when I was eight years old. From then on I have studied Judo, Muay Thai, Jiu Jitsu and Krav Maga. This training of discipline, commitment and self reliance has carried on with me throughout the rest of my life. These skills made me able to adapt to my disability and push myself to complete my preliminary studies with a very high point average. After that, I was inducted into the Polytechnic Institute for Exact Sciences at the age of 14. I was unable to complete my studies there because at age 15 my mother and I migrated to the United States seeking an opportunity for a brighter future and advanced treatments for my eyesight. I currently do research under Dr. Konstantinos Kavallieratos, in the department of Chemistry and Biochemistry at Florida International University. In this lab I focus on the synthesis of fluorescent dyes for the detection of Nitric Oxide in human tissue. In addition to this, I am an Undergraduate Research Assistant at the Optical Imaging Laboratory in the Engineering Center at FIU, where I focus on programming Graphical User Interfaces for the clinical translation of an in house developed optical imaging system.

COMPARISON BETWEEN THE VOIGT AND REUSS MODELS FOR COMPOSITES, AS IT PERTAINS TO THE MINERAL CONTENT EFFECTS ON THE MODULUS OF BIOMATERIALS WITH ISOTROPIC AND ANISOTROPIC DISTRIBUTIONS

Rigoberto Roche & Michael Christie Ph.D, Biomedical Engineering, Florida International University

ABSTRACT

The characteristics and properties of the Voigt and Reuss models for composites are discussed and described in detail. A comparison and contrast between these two models was made in order to determine the particular behavior of certain composite materials as described by the respective expressions. In addition to this, the effect of mineral content on dental filling composites, cements, and porous implants, fibrous and particulate composites in orthopedic implants was described in detail by means of a series of mathematical models that reflected specific trends which differentiate the modular response in isotropic and anisotropic dispersion. Mathematical simulations were performed using a MATLAB® program that took into account all the relevant variables and initial conditions that affect these systems. This model was able to produce a series of graphs that symbolically depict the behavior of the systematic parameters under varied conditions for the respective models as well as isotropic and anisotropic conditions. From this mathematical simulation, it was obtained that the Voigt model follows the behavior of a linear system when describing Young modulus with respect to volume fraction of inclusions. The Reuss model shows an exponential behavior of the modulus as a function of the inclusion volume fraction. For both the isotropic and anisotropic system, the modulus showed decreasing behavior as mineral inclusion fraction increased. This is demonstrated by the reduction in the magnitude of output values that was observed after mineral composition was simulated. Finally, errors were identified regarding the assumptions of the model. Other extraneous factors which could influence the observed response are also described and discussed.

Comparison Between the Voigt and Reuss Models for Composites, as it Pertain to the Mineral Content Effects on the Modulus of Biomaterials with Isotropic and Anisotropic Distributions

Rigoberto Roche

Michael Christie Ph.D

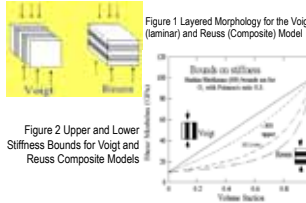Biomedical Engineering, Florida International University, Miami, FL 33174

ABSTRACT

The characteristics and properties of the Voigt and Reuss models for composites are discussed and described in detail. A comparison and contrast between these two models was made in order to determine the particular behavior of certain composite materials as described by the respective expressions. In addition to this, the effect of mineral content on dental filling composites, cements, and porous implants, fibrous and particulate composites in orthopedic implants was described in detail by means of a series of mathematical models that reflected specific trends which differentiate the modular response in isotropic and anisotropic dispersion. Mathematical simulations were performed using a MATLAB® program that took into account all the relevant variables and initial conditions that affect these systems. This model was able to produce a series of graphs that symbolically depict the behavior of the systematic parameters under varied conditions for the respective models as well as isotropic and anisotropic conditions. From this mathematical simulation, it was obtained that the Voigt model follows the behavior of a linear system when describing Young modulus with respect to volume fraction of inclusions. The Reuss model shows an exponential behavior of the modulus as a function of the inclusion volume fraction. For both the isotropic and anisotropic system, the modulus showed decreasing behavior as mineral inclusion fraction increased. This is demonstrated by the reduction in the magnitude of output values that was observed after mineral composition was simulated. Finally, errors were identified regarding the assumptions of the model. Other extraneous factors which could influence the observed response are also described and discussed.

INTRODUCTION

For the purpose of this project we will analyzed composite characteristics based on the Voigt and Reuss models. In a given volume fraction of one phase, the stiffness of the Voigt and Reuss composites for an elastic two-phase composite represent rigorous upper and lower bounds on the Young's modulus. Neglecting Poisson effects and allowing no restriction on the shape of the two phases, the modulus for the Voigt composite is:

$E_c = E_1 V_1 + E_2 V_2$

The overall modulus of the Reuss composite (neglecting Poisson effects on the system) can be described by

$1/E_c = V_1/E_1 + V_2/E_2$.

Composite properties can be attained by the given structures evident in Figure1. These laminates are anisotropic. They represent an identical structure subjected to different orientations of stress. The bounds given by Voigt-Reuss are applicable for isotropic composites. Moduli given by the Voigt-Reuss formulae are analogously attainable by the above hierarchical structures. In this composite the full volume is filled with layers of similar material in the same phase; each layer has a coating of a given fraction unlike that made of the material in the second phase

Figure 1 Layered Morphology for the Voigt (laminar) and Reuss (Composite) Model

Figure 2 Upper and Lower Stiffness Bounds for Voigt and Reuss Composite Models

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A statement made for the bounds tacitly postulates the assumption that both phases are in a minimum initial energy state. They are found to have positive stiffness. Also worth mentioning is that within the interface an ideal attachment with no slip or chemical reactions exist. Thermoelastic effects may also be ignored. For a viscoelastic composite, use of the stated dynamic correspondence principle gives:

$E^*c = E^*1V1 + E^*2V2$

The symbol shown by * is an indicator of a set of complex numbers with a specific magnitude and phase.

METHODS

Comparison of the Voigt and Reuss models for specific composites including dental filling composites and cements, porous implants, and carbon reinforced UHMWPE yielded a tangible set of result that proved mathematically where the analysis of the inclusions Modules was observed. Specified analysis of Adaptic Dental Implants with a modulus of 13.46 GPa The modulus of inclusions and moduli of material was set to one. MATLAB simulations of these models was done to establish the appropriate response that the different materials will have upon an increasing specified parameter of inclusions represented as volume fraction.

Composition and Ideal Modulus of Dental Composites				
Species	Filler	Filler amount	Particle size (µm)	% Elastic, 31°C
Adaptic	quartz	78	11	13
Concise	quartz	77	11	4.8
Nuva Fil	barium glass	78	2	
Isopas	colloidal silica	34	0.05	
Silar	colloidal silica	50	0.04	2.3

Properties of Dental Composites	
Property	Values
Young's Modulus E (Gpa)	10-18
Poisson ratio v	0.24-0.30
Compressive strength (Mpa)	170-260
Shear strength (Mpa)	90-100
Porosity (vol%)	1.6-4.8
Polymerization contraction	1.2-1.6
Thermal expansion α (10⁶/°C)	25-68
Thermal conductivity k (10⁴ cal/sec/cm⁻²/°C/cm)	25-33
Water sorption coeff. (mg/cm²,24 hr, rm. Temp	0.0-0.8

Properties of Carbon- Reinforced UHMWPE			
Fiber amount (%)	Density (g/cm³)	Young's Modulus (Gpa)	Flexural strength (Mpa)
0	0.94	0.71	14
10	0.99	1.01	20
15	1.00	1.4	23
20	1.01	1.5	26

RESULTS

A MATLAB code was created in order to evaluate the differences between the Voigt and Reuss model as functions of inclusion volume fraction. There were several assumptions made in order to simplify the comparison and attain a single variable parameter that could be evaluated for the two models. The base variable used to generate the scopes presented below from the mathematical model was inclusion volume fraction. It was assumed that the inclusions present in the different components were transverse. This was done in order to equalize the evaluation settings for the data analysis process and for the creation of a subsequent algorithm that would generate graphical outputs. It was assumed that the Poisson's range presented in table 2 was an average value in order to find the matrix modulus of the characterized Adaptic dental implant. In addition to this, only one specific material was chosen from the composite category in order to obtain a singular result, representative of the characteristics of the total compendium of such biomaterial type.
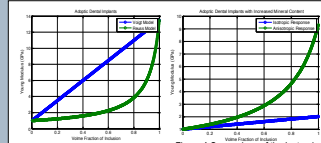

Figure 3 Comparisons of Voigt and Reuss Model for Adaptic Dental Implants

Figure 4 Comparison of the Isotropic and Anisotropic response for Adaptic Dental Implants with Increased Mineral Content
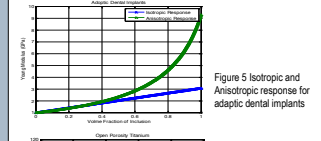

Figure 5 Isotropic and Anisotropic response for adaptic dental implants

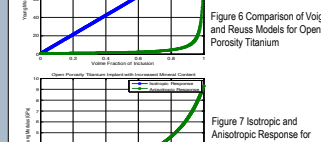Figure 6 Comparison of Voigt and Reuss Models for Open Porosity Titanium

Figure 7 Isotropic and Anisotropic Response for open porosity titanium implant with increased mineral content

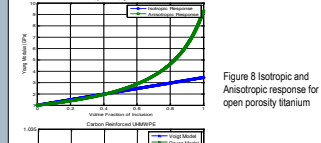Figure 8 Isotropic and Anisotropic response for open porosity titanium

Figure 9 Comparison of the Voigt and Reuss model for carbon reinforced UHMWPE
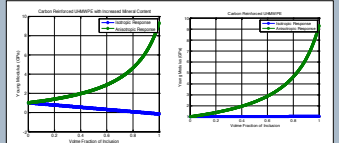

Figure 10 Isotropic and Anisotropic Response for carbon reinforced

Figure 11: Reference to Fig10. This graph serves as a reference for the previous one. This is the systematic response for isotropic and anisotropic modules that are deficient in mineral concentration.

DISCUSSIONS

Mineral content in composite materials affects the properties of the composite and its corresponding modulus. Examination of two models classified as the Voigt and Reuss Models demonstrated different levels of stiffness within the composite materials of interest. Isotropic and anisotropic modular response was closely scrutinized among various composites, including dental fillings, porous implants, and particulate in orthopedic implants. The Voigt model was shown to portray linear behavior with respect to Young's modulus while the Reuss model evidenced an exponential behavior as seen in figures 3, 6 and 10. This was due to the relationship between the modulus and volume fraction inclusion. It is also evident that the behavior of the isotropic modular response was also linear for all types of composites examined. This was shown in figure 4, 5, 7,8,10 and 11.

Upon analyzing the outputs, one can conclude that the modular response is lower when the composites have a certain degree of mineral content. A higher level of mineral content in a given composite will increase the strength of that composite.

Sources of error identified within our parameters were attributed to the assumptions made within our mathematical model. This set of assumptions allowed for the simplification of the calculations in order to model the phenomenon that was being simulated. However, regardless of its limitations, this model can be used for biomaterial selection. By knowing the properties of the biological tissue of interest one can input such properties in the model and generate a mathematical distribution that describes the mechanical response of the composite as a function of inclusions, using the Young's modulus. This allows for the user to determine a ranking for different material for implantation, judging their ability to mimic the mechanical response of the tissue. This is of upmost importance because if there is a mismatch in the strain distribution of a region due to applied stress, it could cause significant hindrance to the implantation and overall healing process. The characteristic evaluation of the mathematical simulation is the most significant aspect of this model because it validates, not only its theoretical application for the addressed comparison, but also the practical approach to a very real and vivid bioengineering challenge, biomaterial selection.

OBJECTIVE

The characteristics and properties of the Voigt and Reuss models for composites are discussed and described in detail. A comparison and contrast between these two models was made in order to determine the particular behavior of certain composite materials as described by the respective expressions.

Andrea Rolong

I was born in Barranquilla, Colombia on the 22nd of August, 1988. I grew up with my parents, two older sisters, and my grandparents. I attended the Italian school Galileo Galilei for elementary, middle and high school and graduated valedictorian of my class. The day after my high school graduation, my father and I moved to the United States to reunite with my mother and my two sisters who were already residing in Miami, Florida. About a month after, I enrolled at Miami Dade College in the pursuit of an Associate's Degree in Chemistry. My decision to pursue Chemistry came from the advice of fellow students and academic advisors who told me that if I wanted to go to medical school, then Chemistry was the obvious choice since it would give me the proper science background. During this time at Miami Dade College I began to recognize that my declared major did not meet my expectations to the fullest and I did not want to consider my four or five years of undergraduate studies as nothing more than a means to an end. One afternoon, while working at the library at Miami Dade College, I came across this article about a field of study that I had heard of before and was very intrigued about. It talked about a relatively new but fast-growing field called Biomedical Engineering. By the time I finished reading the article there was a big smile on my face; I immediately left the computer and ran outside to call my dad, "I found it! I have also had the opportunity to work in research projects both at my home institution as well as at Brown University and the University of Colorado at Boulder during the summers of 2009 and 2010 respectively. My plans after completing my current studies is to move directly into graduate school and work towards my PhD in Biomedical Engineering.

ABSTRACT

ELECTROSPUN NANOFIBER SCAFFOLD IMPREGNATED WITH GROWTH FACTORS FOR SMALL-DIAMETER VASCULAR GRAFTS

Andrea Rolong[1], Walter Bonani[2], and Wei Tan[2]

Current graft treatments of vascular disorders include the use of autografts or allografts; these grafts present scarce availability and discrepancies in size between their original location and their destination site. Non-biodegradable grafts have thus been used in these conditions, but they are found to cause several problems such as graft occlusion, infections, and rejection, which eventually lead to graft failure. To decrease the incidence of these complications, we have designed molecule-impregnated biodegradable grafts which provide a scaffold and environment to stimulate endothelial cell (EC) adhesion, migration and proliferation. EC activities can be increased by incorporating growth factors into the material. PCL and PLGA are widely-used biodegradable polymers; they are selected as scaffolding materials for engineering vascular grafts here. Growth factors such as VEGF are incorporated into a PCL-PLGA graft, and released when the graft degrades. Using a new double-electrospinning technique we developed, the rate of polymer degradation can be adjusted by changing the chemical composition and the nanostructure. Through control over the polymer degradation, a controlled release of the growth factors impregnated in the polymer will be accomplished. The spatial and temporal release of these growth factors into the extracellular space for modulating cell behaviors was studied using MTT assay, cell migration assay as well as spectrofluorometry. The expected outcome is to find an exponential relation between cell proliferation and elapsed time; this will demonstrate continuous release of growth factor. Results from the spatial test, which involves testing the material in a double chamber, are expected to show that release of a specific growth factor occurs only on the side where it was placed.

[1]Florida International University, [2]Mechanical Engineering Department, University of Colorado at Boulder, Boulder, CO

Electrospun Nanofiber Scaffold Impregnated with Growth Factors for Small-Diameter Vascular Grafts

Andrea Rolong[1], Walter Bonani[2], and Wei Tan[2]

[1]Department of Biomedical Engineering, Florida International University, Miami, Fl 33174
[2]Department of Mechanical Engineering, University of Colorado at Boulder, Boulder, CO 80309

Abstract

PCL and PLGA are widely-used biodegradable polymers; they are selected as scaffolding materials for engineering vascular grafts here. Growth factors such as VEGF are incorporated into a PCL-PLGA graft, and released when the graft degrades. Using a new double-electrospinning technique we developed, the rate of polymer degradation can be adjusted by changing the chemical composition and the nanostructure. Through control over the polymer degradation, a controlled release of the growth factors impregnated in the polymer will be accomplished. The spatial and temporal release of these growth factors into the extracellular space for modulating cell behaviors is studied using MTT assay, cell migration assay as well as spectrofluorometry. The expected outcome is to find an exponential relation between cell proliferation and elapsed time; this will demonstrate continuous release of growth factor. Results from the spatial test are expected to show that release of a specific growth factor occurs only on the side where it was placed.

Introduction

Objective

To design molecule-impregnated biodegradable grafts which provide a scaffold and environment to stimulate endothelial cell (EC) adhesion, migration and proliferation

http://www.people.vcu.edu/~gibowlin/research.html

Motivation

- Approximately 3 million procedures associated with vascular disease are performed in the United States every year
- Most are in small-caliber vessels (< 6mm diameter)
- Current treatment:
  - Autografts and allografts
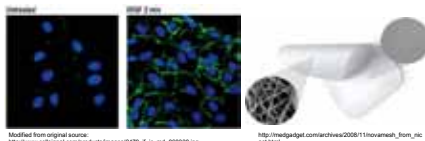 - Non-biodegradable synthetic grafts

http://www.dbmtp.medunivien.ac.at/index.php?id=48
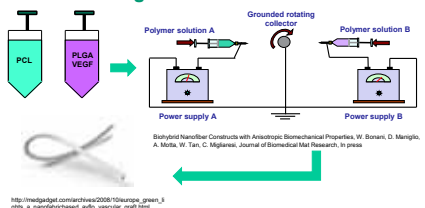
Limitations and Challenges

- Autografts and allografts
  - Scarce availability
  - Discrepancies in size
- Non-biodegradable grafts
  - Surface thrombogenicity
  - Intimal Hyperplasia
  - Infections
  - Rejection by the organism

http://emedicine.medscape.com/article/1018266-overview
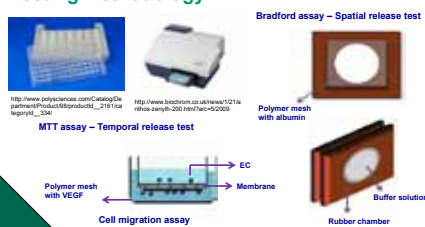
Proposed Solution

- Biodegradable grafts impregnated with growth factors
  - Nanofiber scaffold increases cell adhesion
  - Biodegradability allows for remodeling and regeneration
  - Growth factors (VEGF, PDGF, TGF-β) promote tissue formation and eventually replace the graft

Modified from original source:
http://www.cellsignal.com/products/images/2479_if_ic_md_080330.jpg
http://medgadget.com/archives/2008/11/movamesh_from_nicast.html

Manufacturing Process

PCL | PLGA VEGF

Polymer solution A — Grounded rotating collector — Polymer solution B

Power supply A | Power supply B

Biohybrid Nanofiber Constructs with Anisotropic Biomechanical Properties, W. Bonani, D. Maniglio, A. Motta, W. Tan, C. Miglaresi, Journal of Biomedical Mat Research, In press

http://medgadget.com/archives/2008/10/europe_green_lights_a_nanofabricbased_avfio_vascular_graft.html

Testing Methodology

Bradford assay – Spatial release test

MTT assay – Temporal release test

http://www.polysciences.com/CatalogDepartment/Product/98/productid__2161/categoryId__334/
http://www.biochrom.co.uk/news/1/21/anrthos-zenyth-200.html?arc=5/2009

Polymer mesh with albumin

Polymer mesh with VEGF

Cell migration assay
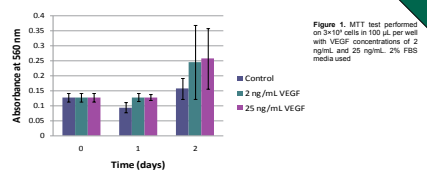
EC
Membrane
Buffer solution
Rubber chamber

Results

Figure 1. MTT test performed on 3×10⁴ cells in 100 µL per well with VEGF concentrations of 2 ng/mL and 25 ng/mL. 2% FBS media used
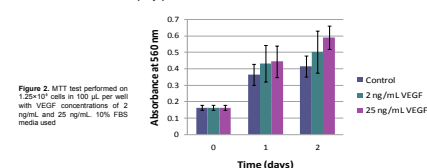
- Control
- 2 ng /mL VEGF
- 25 ng /mL VEGF

Figure 2. MTT test performed on 1.25×10⁴ cells in 100 µL per well with VEGF concentrations of 2 ng/mL and 25 ng/mL. 10% FBS media used

- Control
- 2 ng /mL VEGF
- 25 ng /mL VEGF

Expected Results

- The amount of EC proliferation depends on VEGF concentration and elapsed time
- Dose-response curves can be generated through absorbance and fluorescence detection

- Control
- 2 ng/mL VEGF
- 25 ng/mL VEGF
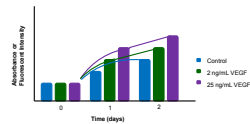
Discussion

- Desired characteristics of vascular grafts:
  - Mechanical stability
  - Biocompatibility
  - Nonthrombogenicity
  - Availability
  - Cost effectiveness

Future Work

- Perform MTT test after incubation with VEGF impregnated graft sample
- Run spatial release test of the albumin impregnated sample in dual chamber
- Perform cell migration test

Acknowledgements

OBJECTIVE

To design molecule-impregnated biodegradable grafts which provide a scaffold and environment to stimulate endothelial cell (EC) adhesion, migration and proliferation.

Karina L. Saravia

Experience is a major component involved in making us who we are. I was born in Miami, FL into a wonderful Nicaraguan family. Between helping my grandma cook in the kitchen and playing softball, my curiosity about the world and the nature of human thought developed. After graduating top ten in my high school class, I was admitted into Florida International University and began my studies in the psychological and biological sciences. As a sophomore I was accepted into the Child Anxiety and Phobia Program (C.A.P.P) as a research assistant under the supervision of Dr. Wendy Silverman. C.A.P.P sparked my interest in development and behavior and allowed me to get a firsthand experience of the research process. It was then I realized that scientific investigation would be necessary to answer the questions I had as a child and young adult. Soon, I began to assist in the Developmental Psychobiology Lab (D.P.B) under Dr. Robert Lickliter. It was there that I began to scientifically explore the mechanisms involved with experience, such as sensory perception from a developmental systems perspective. While assisting in the lab, I was given the opportunity to conduct a research project focusing on how different patterns of stimulus distribution can influence prenatal learning. With the help of my mentor, I presented the project to the Dr. Ronald E. McNair program for a summer research opportunity and thus became a McNair fellow. I am highly interested in how the brain operates as a whole and particularly how external factors can influence internal mechanisms. Following graduation this December, I hope to be admitted into a doctoral program in neuroscience.

DOES THE DISTRIBUTION OF SENSORY STIMULATION INFLUENCE?
PRENATAL LEARNING IN NORTHERN BOBWHITE QUAILS

ABSTRACT

This study explores the relationship between the prenatal frequency of stimulus delivery and the total duration of stimulation to see if a specific combination of these components can provide an optimal context for recruiting attention and facilitating prenatal auditory learning in bobwhite quail embryos. Previous research has shown that when bobwhite quail embryos are presented with an individual variant of the bobwhite maternal call for 10 min/hr for 24 hours, they subsequently show a postnatal preference for that familiar call. However, when the same maternal call is presented for 10 minutes per for12 hours, they no longer show a preference for familiarized call (Lickliter et al., 2002). We hypothesized that if the frequency of stimulus delivery is increased and the duration of each stimulus is decreased (without varying the total amount of prenatal stimulation provided), there may be more opportunities to attend to the stimulus and subsequently show a postnatal preference.

Distribution of Sensory Stimulation: Prenatal Learning in Northern Bobwhite Quails

Karina Saravia & Robert Lickliter
Florida International University
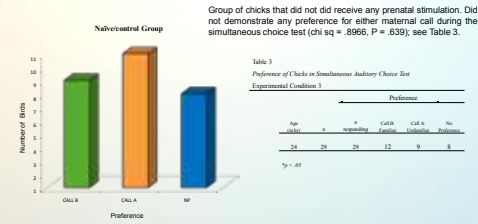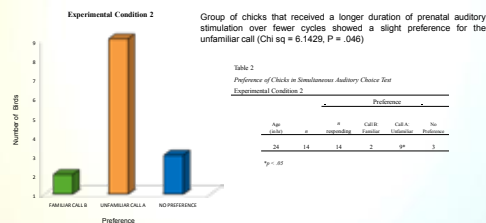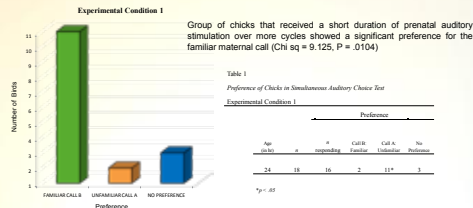Miami, FL

Introduction

Previous studies have shown that the type and amount of prenatal sensory stimulation available to precocial avian embryos can influence prenatal and postnatal perceptual learning and organization. The present study assessed the influence of the *distribution* of prenatal sensory stimulation to the auditory modality and subsequent prenatal learning. Relationships between frequency of stimulus delivery and total duration of stimulation were explored to see if a an optimal context for recruiting attention and facilitating prenatal learning could be established by manipulating the distribution of stimulation during the late stages of the prenatal development in bobwhite quail embryos.

Methods

Northern bobwhite quail (*Colinus virginianus*) embryos (N = 61) were exposed to an individual bobwhite maternal call in one of two conditions 12 hours prior to hatching. In experimental condition 1 (N= 18), embryos received auditory exposure to CALL B, a bobwhite maternal call variant, for 1 minute every 6 minutes for a period of 12 hours (a total of 120 minutes of exposure). In experimental condition 2(N= 14), embryos received the same maternal call (CALL B) for 10 consecutive minutes, every hour for a period of 12 hours (total of 120 minutes). The Naïve/control group (N= 29) did not receive any prenatal auditory stimulation. All chicks were tested postnatally at 24 hrs of age in a simultaneous choice test between the familiarized maternal call and an unfamiliar variant of the bobwhite maternal call. During these tests, the two calls were played from opposite sides of a circular testing arena and chicks were scored for their latency and duration of approach to both calls. A Chi-square test was used to find a p-value .

Results

Experimental Condition 1

Group of chicks that received a short duration of prenatal auditory stimulation over more cycles showed a significant preference for the familiar maternal call (Chi sq = 9.125, P = .0104)

Table 1
Preference of Chicks in Simultaneous Auditory Choice Test
Experimental Condition 1

			Preference		
Age (n/hr)	n	# responding	Call B: Familiar	Call A: Unfamiliar	No Preference
24	18	16	2	11*	3

*p < .05

Experimental Condition 2

Group of chicks that received a longer duration of prenatal auditory stimulation over fewer cycles showed a slight preference for the unfamiliar call (Chi sq = 6.1429, P = .046)

Table 2
Preference of Chicks in Simultaneous Auditory Choice Test
Experimental Condition 2

			Preference		
Age (n/hr)	n	# responding	Call B: Familiar	Call A: Unfamiliar	No Preference
24	14	14	2	9*	3

*p < .05

Naïve/control Group

Group of chicks that did not did receive any prenatal stimulation. Did not demonstrate any preference for either maternal call during the simultaneous choice test (chi sq = .8966, P = .639); see Table 3.

Table 3
Preference of Chicks in Simultaneous Auditory Choice Test
Experimental Condition 3

			Preference		
Age (n/hr)	n	# responding	Call B: Familiar	Call A: Unfamiliar	No Preference
24	29	29	12	9	8

*p < .05

Conclusions

The experimental conditions of this study examined the effects of distributed patterns of prenatal sensory stimulation on subsequent auditory responsiveness to maternal calls in bobwhite quail chicks. Preliminary results showed that chicks that received a variation of the distribution the maternal call for the call for 1 minutes every 6 minutes showed a preference for the familiar call they were prenatally exposed to, although they did show a preference for the unfamiliar call when tested in a simultaneous choice test.

Thus far, results indicate that a substantial difference in learning exist between the preference demonstrated in all three conditions even though the amount of total duration was consistent for both prenatal manipulations.

A major limitation of this study was the small sample size. Further exploration of this topic may provide insights into the optimal range of stimuli distribution for learning in bobwhite quails. The data presented is not sufficient to allow any precise predictions regarding prenatal learning and the optimal thresholds or levels of stimulation required to achieve perceptual learning in embryos or neonates. The neural structures responsible for these mechanisms of prenatal selective attention and memory formation should also be explored.

FIU FLORIDA INTERNATIONAL UNIVERSITY

OBJECTIVE

Explore the relationship between the prenatal frequency of stimulus delivery and the total duration of stimulation.

Luis E. Saumell San Martin

My name is Luis E. Saumell San Martin, I am a McNair Fellow from the 7th cohort. I was born in La Habana, Cuba on September 29th, 1985 (I am 25 years old). While I was in Cuba, I started my university studies in Computer Science in University of Havana. After my first year at the university in Cuba I came to Miami, USA, in January 2006. In May 2006 I started my English studies in Miami Dade College, and in the Spring 2007 I started to pursue the Associate in Arts in Miami Dade College. Then, in Summer 2008 I transferred to FIU (honors college) with my A.A. and started my major in Mathematics because while I was in Cuba studying Computer Science I discovered that Mathematics was my passion. Nevertheless, I continued taking Computer Science classes too. Then I became a McNair Felllow (7th cohort) and I had the opportunity to do research this Summer 2010 at University of Notre Dame. I graduated this past Summer (2010) with a bachelor in Mathematics and a minor in Computer Science. I am now working on my Master Degree in Mathematical Sciences at FIU.

ABSTRACT

SMOOTH PROJECTIVE TORIC VARIETIES

The relation between Mathematics and Physics has proven to be very fruitful: Mathematics methods are developed for serving the needs of Physics as well as accurate math models help physicists find new phenomena in their field. The second part of the last Century was full of great achievements both in Physics and Mathematics based on that relation: the standard model for particles in Physics, applications of Yang-Mills theory in Mathematics, string theory, to name some of them. In this project, we study one aspect of that relation. The focus of this work is to study a class of mathematical objects, called toric varieties, which are used to model the mirror symmetry phenomenon in physics. Toric varieties are complex manifolds on which a complex torus acts with a dense orbit. These manifolds can be studied by algebraic and combinatorial methods (they belong in a common ground of algebraic geometry and the theory of convex cones in Euclidean spaces). These objects are important because it was realized in the decade of 1980 that many nice examples of physics theories can be based on toric varieties. In particular, the mirror symmetry - a phenomenon related to the super-string theory, the theory that hoped to unify the forces in physics, can be modelled easily on such varieties. Therefore, the core of this work is to study toric varieties, and more specifically smooth toric varieties in the Projective Space.

Smooth Projective Toric Varieties

Luis E. Saumell[1], Nero Budur[2] P.hD, M. Yotov[3] P.hD

1 – Student at Florida International University, 11200 S.W. 8th Street, Miami, Florida, 33199
2 - Assistant Professor, University of Notre Dame, Mathematics, 255 Hurley Hall, Notre Dame, IN 46556
3 - Assistant Professor, Florida International University, Mathematics, 11200 S.W. 8th Street, Miami, Florida 33199

ABSTRACT

The relation between Mathematics and Physics has proven to be very fruitful: Mathematics methods are developed for serving the needs of Physics as well as accurate math models help physicists find new phenomena in their field. The second part of the last Century was full of great achievements both in Physics and Mathematics based on that relation: the standard model for particles in Physics, applications of Yang-Mills theory in Mathematics, string theory, to name some of them. In this project, we study one aspect of that relation. The focus of this work is to study a class of mathematical objects, called toric varieties, which are used to model the mirror symmetry phenomenon in physics. Toric varieties are complex manifolds on which a complex torus acts with a dense orbit. These manifolds can be studied by algebraic and combinatorial methods (they belong in a common ground of algebraic geometry and the theory of convex cones in Euclidean spaces). These objects are important because it was realized in the decade of 1980 that many nice examples of physics theories can be based on toric varieties. In particular, the mirror symmetry - a phenomenon related to the superstring theory, the theory that hoped to unify the forces in physics – can be modelled easily on such varieties. Therefore, the core of this work is to study toric varieties, and while doing so we aim to provide a classification of smooth toric varieties in the Projective Space.

DEFINITION OF TORIC VARIETY

A toric variety X is an irreducible variety that contains a torus as an open subset and such that the action of the torus to itself extends to an action of the torus to X.
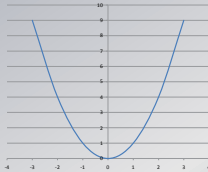
SMOOTHNESS

A point $p \in X$ is said to be smooth or nonsingular if $\dim T(p)X = \dim X$. A toric variety X is smooth if every point is smooth.

Affine representation of the smooth projective toric variety:

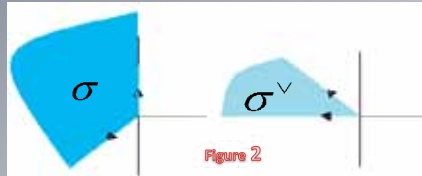$$X = V\left(y^2 - xz\right) \subsetneq P^2$$

Figure 1

THREE WAYS TO CONSTRUCT A TORIC VARIETY

• Lattice points
• Toric Ideals
• Affine Semigroups

RATIONAL POLYHEDRAL CONES

A rational polyhedral cone is a set of the form:

$$\sigma - \left\{ \sum_{u \in S} \lambda_i u \mid \lambda_i \geq 0 \right\}, \text{ where S is a finite subset of a lattice N.}$$
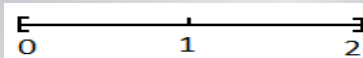

A rational polyhedral cone, σ and its dual, $\sigma^{\vee}$.

CONES AND AFFINE TORIC VARIETIES

Let σ be a strongly convex rational polyhedral cone. Then we define its dual cone to be the strongly convex rational polyhedral cone:

$$\sigma^{\vee} - \left\{ m \mid \langle m, u \rangle - \sum m_i u_i \geq 0, \forall u \in \sigma \right\}$$

Note that this dual cone is generated by elements in the corresponding dual lattice, M, hence the name of dual cone. Now, the set $S_\sigma = \sigma^{\vee} \cap M$ is an affine semigroup and so we get the affine toric variety $U_\sigma - \text{Spec } \mathbb{C}_{\sigma}$.

One dimensional smooth lattice polytope corresponding to the smooth toric variety in figure 1.
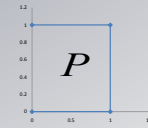
Figure 3

FANS, POLYTOPES AND TORIC VARIETIES

A fan $\sum$ is a finite collection of strongly convex rational polyhedral cones satisfying the following properties:
• The intersection of any two cones of the fan is a face of each.
• A face of any cone in the fan is again a cone in the fan.

A toric variety can be constructed from a fan $\sum$ and denoted by $X_{\sum}$ in the following way: For every cone in the fan we get an affine toric variety, then $X_{\sum}$ is the union of all of this affine toric varieties and glue together via the intersections of any two affine pieces which correspond to the intersection of their corresponding cones.
Every smooth toric variety is of the form $X_{\sum}$.

A polytope P is the convex hull of a finite set S. That is,
$$P = Conv(S) = \left\{ \sum_{u \in S} \lambda_i u \mid \sum_{i=1}^{|S|} \lambda_i = 1, \lambda_i > 0 \right\}.$$ So we have that a polytope is the convex hull of its vertices, which are faces of dimension zero. A lattice polytope is a polytope where all its vertices are lattice points. A polytope has a fan associated to it, called the normal fan.

$$X_P = V\left(x_0 x_3 - x_1 x_2\right)$$

Here $\left(x_0 : x_1 : x_2 : x_3\right)$ are taken to be homogeneous coordinates in the 3-dimensional projective space.

2-dimensional smooth lattice polytope and its corresponding smooth projective toric surface.

Figure 4

CRITERION TO FIND SMOOTH PROJECTIVE TORIC VARIETIES

To get an n-dimensional smooth projective toric variety we need to do the following:
• Fix a lattice M of dimension n, say $M - Z^n$
• Find a full dimensional lattice polytope P in the lattice, and let the number $s = |P \cap M|$
• Construct the map $\varphi : \mathbb{C}^{*n} \to P^{s-1}$ by using the characters induced by the intersection of the polytope with the lattice. This map is a projective embedding.
• The zarisky closure in the s-1 dimensional projective space of the image of this map is the n-dimensional smooth projective toric variety X_P.
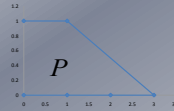
SOME SMOOTH LATTICE POLYTOPES AND THEIR PROJECTIVE SMOOTH TORIC VARIETIES
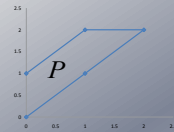
$$\varphi : \mathbb{C}^{*2} \to P^4$$
$$\left(x, y\right) \mapsto \left(xy : x^2 y^2 : xy^2 : y\right)$$
$$X_P = V\left(x_1 x_3 - x_2 x_4, x_1 x_4 - x_0 x_3\right)$$

$$\varphi : \mathbb{C}^{*2} \to P^5$$
$$\left(x, y\right) \mapsto \left(x : x^2 : x^3 : xy : y\right)$$
$$X_P = \overline{Im \varphi}$$

Figure 5

ACKNOWLEDGEMENTS

OBJECTIVE

The focus of this work is to study a class of mathematical objects called toric varieties which are used to model the mirror symmetry phenomenon in physics.

Maria Talavera

My name is Maria Talavera and I am 23 years old. My ethnicity is Cuban and Spanish descent and I was born in Hialeah, Florida. My current academic standing is a Senior and my major is Biology. My current research topic is observing alterations, generally inhibition, of restriction enzyme activity that has been employed frequently to determine the sequence specificity of the binding of many types of molecules to DNAs. While examining the competitive binding of a variety of intercalators (Netropsin, bis(((di(aminoethyl) amino)ethyl)amino)anthracene-9,10-dione, tetra(N-methyl-4-pyridyl)porphine, ethidium) to a mixture of supercoiled and relaxed circular phiX174RF DNAs using restriction enzymes which cleave once or twice. I conducted this research under Dr. Stephen Winkle at Florida International University. I became interested in my research topic because Cancer has impacted my life several times, I've lost loved ones due to this disease and my mom is a colon cancer survivor. I found the topic very interesting because it could help improve our understanding of how certain drugs interact in mutative conditions. This way we can develop drugs which would be a lot more effective to treat cancers. I really enjoy cooking and sports. My favorite food is New York-style cheese pizza and Fettuccini Alfredo.

ABSTRACT

RESTRICTION ENZYME ACTIVITY ANALYSIS OF SMALL MOLECULE BINDING TO DNA: CONSIDERATIONS OF TOPOLOGY AND FLANKING SEQUENCES

We will be observing alterations (generally inhibition) of restriction enzyme activity that has been employed frequently to determine the sequences specificity of the binding of many types of molecules to DNAs. Generally, these studies have either employed restriction enzymes which cut the target DNA several times or employed "short," linear DNA fragments. In this study, we examined the competitive binding of a variety of intercalators (Netropsin, bis(((di(aminoethyl)amino)anthracene-9,10-dione, tetra(N-methyl-4-pyridyl)porphine, Ethidium bromide) to a mixture of supercoiled and relaxed circular X174RF DNA using restriction enzymes which cleave once or twice, e.g., Ava II, BssH II, Dra I, Mlu I, Nci I, Nru I, Pst I, Stu I, Xho I, Nar I, AL W44. All studies will be at low ligand/base pair ratios so that binding to primary sites is monitored. For many of these molecules are known to twist DNA and may bind cooperatively – perhaps more readily done with linear DNA.

Restriction Enzyme Activity Analysis of Small Molecule Binding to DNA: Considerations of Topology and Flanking Sequences

S.A. Winkle, M.D. Talavera, Department of Chemistry and Biochemistry, Florida International University, Miami, Florida 33199

ABSTRACT

We will be observing alterations (generally inhibition) of restriction enzyme activity that has been employed frequently to determine the sequence specificity of the binding of many types of molecules to DNA. Generally, these studies have either employed restriction enzymes which cut the target DNA several times or employed "short", linear DNA fragments. In this study, we will examine the competitive binding of a variety of intercalators (Netropsin, bis(((di(aminoethyl)amino)ethyl)amino)anthracene-9,10-dione, tetra(N-methyl-4-pyridyl)porphine, ethidium) to a mixture of supercoiled and relaxed circular ΦX174RF DNAs using restriction enzymes which cleave once or twice, e.g., Ava II, BssH II, Dra I, Mlu I, Nci I, Nru I, Pst I, St I, Xho I. All studies will be at low ligand/ base pair ratios so that binding to primary sites is monitored.

INTRODUCTION

Restriction enzymes are enzymes that surf along DNA and cleave at specific nucleotide sequences. In this case, they will be used to help locate particular sequences where several drugs of interest would bind to. We plan to study the drugs' behavior when competing with restriction endonucleases, as well as how they interact with DNA upon binding. PhiX174RF will be used in this study. Drugs used in this study included Netropsin, Ethidium Bromide, tetra(N-methyl-4-pyridyl)porphine (Porphyrin), bis(((di(aminoethyl)amino)ethyl)amino)anthracene-9,10-dione (Ametantrone) and Actinomycin D. All of these are known to intercalate relaxed and supercoiled DNA. Intercalation of DNA occurs when the drug molecule binds itself between two base pairs within the DNA molecule.

Figure 1: Molecular structure of Actinomycin D (left), *Porphyrin* (center), Netropsin *(right)*
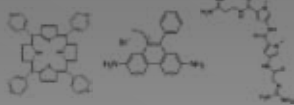
HYPOTHESIS

If a drug's affinity is great for a sequence that resembles the cleaving site of the enzyme of interest, there should be some sort of intercalation which ultimately would inhibit cleavage.

METHODOLOGY

All Restriction Endonucleases and buffers used were ordered from Promega Laboratories and Fisher Scientific Laboratories. Enzyme dilutions were constructed using 5 µl of the pure restriction endonucleases of interest, 5 µl of its corresponding buffer and 40 µl of Glycerin. Samples were numbered from 1 to 6. In this experiment we used 1:10 dilution of ΦX174 DNA.

Sample #	Drug	H2O	Buffer	DNA	Total
1	0 µl	7 µl	1 µl	4 µl	12 µl
2	0 µl	7 µl	1 µl	4 µl	12 µl
3	1 µl	6 µl	1 µl	4 µl	12 µl
4	2 µl	5 µl	1 µl	4 µl	12 µl
5	3 µl	4 µl	1 µl	4 µl	12 µl
6	4 µl	3 µl	1 µl	4 µl	12 µl

Table-1: Sample protocol

Samples one through six were incubated for 15 minutes at a temperature of 37˚C. After fifteen minutes, these samples were taken out of the incubator. Samples 2 through 6 were given 3µl of enzyme dilution and placed back to be incubated for 15 more minutes. After the incubation period ended, 5 µl of 1% sodium dodecyl sulfate was added to samples 1 through 6. The samples were then incubated at 65˚C for eight minutes. An amount of 4 µl of tracking dye was added to every sample. A 1% Agarose gel is made; contents include 2 grams of Agarose (s); 178mL of deionized H2O; and 20mL of TBE. Agarose gel electrophoresis was carried out in a FisherBiotech Mini-Horizontal Unit; model FB-SB-710. For specific information on this process, view article in references (2). After gel electrophoresis is complete, the Agarose gel is to be placed for 15 minutes in a Ethidium staining bath. After completing this staining bath, the gel is ready to be viewed under UV light for results.

EXPECTED RESULTS

Drug/Enzyme	ALW44	Ava II	BssH II	Nci I	Pst I	Stu I	Xho I
Act D	IR/ISC	IR/NSC	IR/NSC	PIR/NSC	ER/ESC	PIR/NSC	IR/NSC
Amet	NR/ISC	NR/ISC	N/N	IR/ISC	PIR/ISC	IR/NSC	NR/ISC
EB	--	PIR/PISC	PIR/PISC	IR/NSC	PIR/ISC	--	IR/PISC
Porphyrin	I/I	I/I	ER/ESC	PIR/NSC	IR/PISC	I/--	I/I

Table-2: Enzymes that cleave ΦX174 DNA once and their respective results when interacted with various drugs. I stands for inhibition of cleavage, P stands for partial, E stands for enhancement, N stands for no enzyme inhibition. R and SC are abbreviations for relaxed DNA and supercoiled DNA, respectively. Act D stands for Actinomycin D, Amet stands for Ametantrone, and EB stands for Ethidium Bromide.

Drug/Enzyme	Dra I	Mlu I	Nar I	Nru I
Act D	PIR/NSC	IR/ISC	--	IR/NSC
Amet	IR/PISC	NR/ISC	PIR/ISC	--/ISC
EB	IR/ISC	IR/PISC	--	IR/PISC
Porphyrin	PIR/ISC	PIR/--	--	IR/--

Table-2: Cont.

[Netrop.]	ALW44	Ava II	BssH II	Dra I	Mlu I	Nar I	Nci I	Nru I	Pst I	Stu I	Xho I
1:100 dilution	IR/ISC	NR/NSC	NR/NSC	I/I	NR/NSC	IR/ISC	NR/NSC	PI/I	NR/NSC	PIR/--	NR/NSC
1:25 dilution	PIR/ISC	IR/ISC	ER/ESC	--	I/I	--	I/I	--	IR/ISC	--	I/I

Table-3: Results with Netropsin at different concentrations

ACKNOWLEDGEMENTS

REFERENCES

Meyers, Jane Aldrich, David Sanchez, Lynn Elwell, and Stanley Falkow. "Simple Agarose Gel Electrophoresis Method for the Identification and Characterization of Plasmid Deoxyribonucleic Acid." *Journal of Bacteriology*. 127.3 (1976): 1529-1537.

OBJECTIVE

Study the drugs' behavior when competing with restriction endonucleases, as well as how they interact with DNA upon binding.

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