



**5th Annual**  
**Undergraduate Research Symposium (URS) of the**  
**College of Natural Sciences and Mathematics**

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March 8, 2016  
Hughes Gymnasium  
University of West Alabama  
Livingston, AL



## **Poster Sessions & Graduate School/Career Expo**

Hughes Gymnasium

- ❖ Poster setup (Hughes Gym) 8:00 a.m.–9:15 a.m.
- ❖ Poster viewing session, Judging, and Graduate School/Career Exhibition (Hughes 9:30 a.m.–11:30 a.m.)
- ❖ URS Group Photo 11:30 a.m.
- ❖ Lunch (Cafeteria) 11:45 a.m.–1:00 p.m.
- ❖ Public Viewing Session 1:15–2:30 p.m.
- ❖ Graduate School/Career Exhibition Forum (Tutwiler Conference Center) 1:15–2:30 p.m.
- ❖ Public Viewing Session 2 1:15 p.m.–3:30 p.m.
- ❖ Guest entertainment or free time (Bibb Graves Quad) 3:45 p.m.–5:30 p.m.

### **Keynote Address and Awards Banquet**

Bell Conference Center 6:00 p.m.–8:00 p.m.

Welcome

Keynote Address

Dinner

Awards Ceremony

Group Photo

## **Organizing Committee**

Dr. Mustafa Morsy, Chair

Dr. Brian Burnes

Dr. Jing Chen

Mrs. Hoda Hassan

Dr. John McCall

Dr. Ketia Shumaker

## Message from the Dean

The College of Natural Sciences and Mathematics places great emphasis on involving our students in actual research. We strongly believe that science is more than a collection of facts; it is a process - a way of doing things. The best way to learn science, is to DO science. When students engage in independent research under the guidance of talented faculty mentors, they gain an insight into the process that can be gained in no other way. The resulting immersion into the techniques of academic research provides undergraduate students with a deeper understanding of their academic fields and prepares them for further success in their academic pursuits and future careers. The faculty of the College of Natural Sciences and Mathematics pays special attention to a student's individual interests and identity, and takes pride in helping research participants concentrate in their field of focus and refine the skills of scientific research.



The College sponsors the Undergraduate Research Symposium (URS@NSM), which is held on Assessment Day each Spring Semester. On this day, we celebrate the year's research efforts and students present the results of their research activities to a panel of judges and to the broader community. Undergraduates from a wide range of disciplines present current and recent research projects, showcasing a wide range of topics, approaches, and interests. The URS@NSM also serves as a resource for other undergraduates not yet engaged in research pursuits. Such students can learn how their fellow students developed their intellectual interests, how they initiated and developed their research projects, and how they developed and nurtured connections with their faculty mentors. Finally, URS@NSM is an occasion for students, faculty, staff, prospective students, and alumni to witness how student projects enhance learning, support faculty members' own work, and serve the greater community.

John McCall, Dean of the College of Natural Sciences and Math

## Message from the URS Committee Chair

On the behalf of the organizing committee, I welcome you to the fifth Annual Undergraduate Research Symposium (URS) at the College of Natural Sciences and Mathematics. In the past four years, the URS has been quite successful. The URS provided an accessible forum for UWA undergraduate students to display and promote some of their exemplary research. In addition, the URS provided UWA students with opportunities to network with graduate schools and industry representatives. We are very pleased that the fifth annual URS provides the same opportunities for students from seven regional institutions. The expansion of URS regionally will promote faculty and student collaborations among participating institutions.



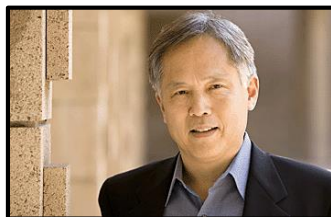
We are delighted that the keynote speaker is Dr. David Asai, Director of the Undergraduate Science Education Programs at Howard Hughes Medical Institute. Also, we are thrilled to report that the fifth annual URS features 36 poster presentations, a 25% increase from previous year, and 12 graduate schools and employers present for the Career/Graduate School Expo.

We look forward to further growth for the URS in 2017, and more participation from UWA and other institutions.

Mustafa Morsy, URS Committee Chair

## Keynote Speaker

The keynote speaker is Dr. David Asai, Director of the Undergraduate Science Education Programs at Howard Hughes Medical Institute (HHMI) in Chevy Chase, Maryland. Asai is an accomplished science educator with many years of experience. He is a prolific researcher and a world expert in the field of dynein structure and function in ciliated protozoa. He received the B.S. and M.S. in Chemistry from Stanford University, and his Ph.D. from the California Institute of Technology. He was a National Institute of Health postdoctoral fellow at the University of California, Santa Barbara.



Asai served as a professor at Purdue University for 19 years, where he was elected to the Purdue Teaching Academy and inaugurated into the Purdue Book of Great Teachers. In 2003, Asai was recruited by Harvey Mudd College as a professor and chair of the biology department, where he served for 5 years. In 2008, he joined HHMI as Director of the Precollege and Undergraduate Science Education Programs, overseeing various programs with annual disbursements of approximately \$60 million.

Asai continues to develop innovative teaching methods and focuses on identifying better measures of success in science education. Asai is undertaking a mission to have his college and university colleagues to take on big questions as: How is science best taught across disciplines? How can students be best prepared to learn about science? How can the ranks of scientists be diversified? How can faculty members become better teachers? Asai believes that experiments in education represent the best way to find answers. Asai is in the in the forefront of a national movement to incorporate research into undergraduate education. His keynote address will highlight the importance of undergraduate research, and opportunities offered by Howard Hughes Medical Institute to undergraduates and faculty.

## Table of Contents

Message from the Dean.....	v
Message from the URS Committee Chair .....	vi
Keynote Speaker .....	vii
Table of Contents.....	viii
Abstracts .....	1
1. In-season Strength Decline between Collegiate Division 2 Offensive and Defensive Lineman .....	1
2. The Effects of garlic extract on the Growth of Tramp-C Cancer Cells using the MTT Assay .....	2
3. Microbiome and Antibiotic Discovery in the Saline Gradient of the Simpson Wild Life Sanctuary .....	3
4. The Effects of Selenium on the Growth of Murine Tramp-C Prostate Epithelial Cancer Cells using the MTT Assay .....	4
5. The Effects of Pomegrante Juice on the Growth of Murine Tramp- C Prostate Epithelial Cancer Cells using the MTT Assay .....	5
6. The Effects of Zinc on Cancer Cell Viability using the MTT assay .	6
7. ARFGEF localization and function in <i>S. pombe</i> .....	7
8. Dopamine linked to stress tolerance and reproductive performances in <i>Drosophila melanogaster</i> .....	8
9. Uncovering Tomorrow's Medicine: The Search for New Antibiotic Cures in Dirt.....	9
10. The Effects of spinach extract on the Growth of Murine Tramp-C2 Prostate Cancer Cells using the MTT Assay .....	10
11. Fungal Symbionts Improve Tomato Production .....	11
12. A study of Gingko Sarcotesta .....	12



13. Reserpine alters dopamine homeostasis and induces oxidative stress: <i>Drosophila melanogaster</i> a model system to study the human diseases .....	13
14. Pathogens vs. Unknown Bacteria: A Search for Novel Antibiotics .....	14
15. The Effects of Vitamin D on Cancer Cell Viability Using the MTT Assay.....	15
16. Identification and Molecular Characterization of a High Light-sensitive <i>Chlamydomonas reinhardtii</i> mutant, 10E35.....	16
17. Hypoxic coma as a strategy to survive inundation across ground hunting arachnid taxa.....	17
18. The effects of Turmeric on cancer cell viability using the MTT assay.....	18
19. Human Tear Lysozyme Effectiveness .....	19
20. Mitigation of Health Effects due to Climate Change .....	20
21. Fighting Antibiotic Resistant Bacteria: The Search for Novel Antibiotics .....	21
22. The effects of Omega-3 fatty acids on cancer cell viability using the MTT assay .....	22
23. Antibiotics: Diamonds in the Dirt .....	23
24. The Biological Fight between Soil and Antibiotic Resistant Bacteria.....	24
25. The Effects of Exercise-Induced Bronchoconstriction (EIB) On Oxygen Deficit and Oxygen Debt in Athletes and Non-Athletes During Exercise .....	25
26. The effects of Green Tea on cancer cell viability using the MTT assay.....	26
27. Discovery of New Antibiotic Producing Bacteria .....	27
28. The effects of fennel seed extract on cancer cell viability using the MTT assay .....	28

29. The physiological effects of <i>Triadica sebifera</i> on <i>Rhinella marina</i> .....	29
30. The Effects of omega-3 fatty acids on the Growth of Murine Tramp-C Prostate Epithelial Cancer Cells using the MTT Assay.	30
31. Characterization of the Venom Proteome for the Wandering Spider, <i>Ctenus hibernalis</i> (Aranea:Ctenidae) .....	31
32. Effects of Energy Drinks on Stress Tolerances and Movement Behavior of <i>Drosophila melanogaster</i> : Dopamine synthesis pathway a significant target of energy drinks.....	32
33. The effects of broccoli extract on cancer cell viability using the MTT assay for cell viability.....	33
34. Sources of <i>E. coli</i> in Little Lagoon .....	34
35. The Effect of Birmingham’s Urban Heat Island on Moth Phenology .....	35
36. The Effects of Ganoderma Lucidum Mushroom Extract on the Growth of Murine Tramp-C Prostate Epithelial Cancer Cells using the MTT Assay .....	36
37. The effects of cabbage extract on cancer cell viability using the MTT assay.....	37
Activities and Outreach Offered by NSM.....	38
Tri-Beta Biological Honor Society .....	38
Alpha Epsilon Delta .....	38
Science Saturdays.....	38
Science Coffee Shop.....	39
Science Olympiad .....	39
West Alabama Regional Science Fair .....	40
STEM Freshman Seminar.....	41
UWA BOSS .....	40
UWA’s Project Engage .....	41
The Alabama Onsite Wastewater Association Training Center .....	41

Sumter County Nature Trust ..... 42  
Fossils of the Black Belt ..... 42  
Participating Organizations ..... 43  
Author Index..... 44  
Acknowledgements ..... 47

### 1. In-season Strength Decline between Collegiate Division 2 Offensive and Defensive Lineman

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Intro: Strength is needed by athletes to increase on-field performance. Football players participate in year round strength training. Strength may decline in-season due to environmental conditions, nutrition, or tapering of strength training. Therefore, this study will research in-season strength decline in offensive and defensive lineman.

Purpose: To investigate in-season strength decline between collegiate division two offensive and defensive lineman.

Methods: IRB was sought and informed consent was obtained. Ten collegiate offensive and defensive lineman were selected. Standard anthropometrics were measured. After resting measurements were obtained, a one-repetition max bench press was performed. Another 1-repetition max was obtained mid-season.

Stats: Data were presented as mean  $\pm$  standard deviation. T-Test was used to determine the differences in pre-season and mid-season one-repetition max bench press. The analysis was performed using SPSS software (SPSS version 20, 2015). Statistical significance was  $p < 0.05$ .

Results: There was no significant difference in one-repetition max bench press pre-season to in-season. In fact, strength increased from pre-season to in-season. High intensity, short duration strength training workouts, limited practices, and limited playing time in games could all be factors.

Discussion: Data indicated that both offensive and defensive lineman in-season strength increased. Of note, offensive lineman one-repetition max bench press increased more than defensive lineman. Although the offensive lineman strength increased more than defensive lineman, there was no significant increase. A larger sample size may be needed to substantiate the data.

## **2. The Effects of garlic extract on the Growth of Tramp-C Cancer Cells using the MTT Assay**

Laila alonazi, Janis Beard, and Jeffery Merida

Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

Prostate cancer is the most common cancer among men 40 to 69. Cancer starts when a cell in the body starts to growing out of control. The prostate gland is located below the urinary bladder and functions in the production of semen. There are components in fruits and vegetables that play a significant role in reducing prostate cancer. Men are encouraged to intake these vegetables which may be beneficial in the prevention of prostate cancer. One such vegetable is garlic we have used murine Tramp-C prostate cancer cells to perform experiments. These cells are generally used for research on prostate cancer. Studies have shown that men who supplement their diet with garlic can significantly reduce their levels of prostate-specific antigen (PSA). There are several components that, previous studies have shown, reduce metastasis in prostate cancer cells. The purpose of this research is to determine if a garlic extract has a direct effect on the growth of these cells. In this research the murine cells were grown under normal conditions of 37 deg-C and 5% CO<sub>2</sub>. These cells were assessed for their growth using inverted light microscopy and the MTT colorimetric assay for cell viability. We will present data showing the difference in the growth of cells treated and not treated with garlic extract.

### **3. Microbiome and Antibiotic Discovery in the Saline Gradient of the Simpson Wild Life Sanctuary**

Riley King, Mara Deluca, and Mustafa Morsy

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The Stimpson Wildlife Sanctuary (SWS) in Clarke County, Alabama was an indispensable salt mine to the Confederacy during the Civil War. The SWS soil is characterized by a salt gradient, ranging from zero to 500mm Total Dissolved Salts (TDS). The salt gradient provides an opportunity to explore bacterial diversity and antibiotics production in response to salt. The goals of this study are to: 1) compare the diversity of antibiotic producing bacteria in the SWS soil with salt gradient, and 2) examine the general microbiome diversity within the soil with salt gradient. Our hypothesis states “soil with significant salt level contains more diverse and higher numbers of antibiotic producing bacteria compared to soil with lower salt concentrations”. We have collected soil samples from the saline gradient of the SWS, ranging from 0-500mm TDS. Soil bacteria was isolated by plating serial dilutions of soil extracts onto several media and grown at two different temperatures. Nearly 3,000 bacterial colonies were isolated and arrayed into 96 well plates. We have identified 240 inhibition zones produced by the unknown bacteria against various ESKAPE pathogens. Majority of the antibiotic producing bacteria was obtained from soil with 50mm TDS, and the lowest number from soil with zero TDS. These results supports our hypothesis of increased number of antibiotic producing bacteria based on salt levels. Ongoing research includes bacterial identification using rRNA sequencing and Gram staining. Our research will provide the first insights into the role of salt stress in the SWS on the soil microbiome diversity.

#### **4. The Effects of Selenium on the Growth of Murine Tramp-C Prostate Epithelial Cancer Cells using the MTT Assay**

James Nemeth, Fatimah Alhassan, and Jeffery Merida

Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

Prostate cancer is highly prevalent in men ages 40-69. Murine Tramp-C prostate cultured cells are used to perform experiments at conditions in which cells can and cannot grow. These cells are generally used for research on prostate cancer. Once at a certain age, men are encouraged to be mindful of their health and aware of their dietary habits. Studies have shown that men who supplement their diet with selenium can significantly reduce their levels of prostate-specific antigen (PSA). There are several components that, previous studies have shown, reduce metastasis in prostate cancer cells. The purpose of this research is to determine if selenium has a direct effect on the growth of these cells. In this research the murine cells were grown under normal conditions of 37 deg-C and 5% CO<sub>2</sub> for 7 days. The cells were grown in RPMI essential nutrients medium. To deter contamination, the cell medium was supplemented with a penicillin/streptomycin antibiotics cocktail. To stimulate the growth of the cells, bovine insulin was also added to the medium. These cells were assessed for their growth using inverted light microscopy and the MTT colorimetric Assay for cell viability. We will present data showing the difference in the growth of cells treated and not treated with selenium.

## **5. The Effects of Pomegranate Juice on the Growth of Murine Tramp-C Prostate Epithelial Cancer Cells using the MTT Assay**

Ezekiel Ufomadu, Fatimah Alhassan, and Jeffery Merida

Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

Prostate cancer has gone on a rampant surge in many men in the ages of 40-69. Murine Tramp-C prostate cultured cells are used to perform experiments at conditions in which cells can and cannot grow. These cells are generally used for research on prostate cancer. Once at a certain age, men are encouraged to be mindful of their health and aware of their dietary habits. Studies have shown that men who add pomegranate juice to their diet can significantly reduce their levels of prostate-specific antigen (PSA). Pomegranate, or referred as in old age the sweet seeded fruit of ancient myth, is a rich source of antioxidants, and scientists have discovered possible health benefits dealing with cancer. The juice in the pomegranate contains polyphenols, isoflavones, and ellagic acid. These elements have been shown to make a forceful anticancer component. There are several components that, previous studies have shown, reduce metastasis in prostate cancer cells. The purpose of this research is to determine if pomegranate juice has a direct effect on the growth of these cells. In our examination, the murine cells were developed under normal conditions of 37 deg-C and 5% CO<sub>2</sub>. The cells were grown in DMEM essential nutrients medium. To prevent contamination, the cell medium was supplemented with a penicillin/streptomycin antibiotics blend. To stimulate the growth of the cells bovine insulin was also added to the medium. These cells were assessed for their growth using inverted light microscopy and the MTT colorimetric Assay for cell viability. We will present data showing the different variations in the growth of cells treated and not treated with pomegranate juice.



## **6. The Effects of Zinc on Cancer Cell Viability using the MTT assay**

Kasabria Fields, Fatimah Alhassan, and Jeffery Merida

Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

Prostate cancer is becoming a rising issue among men between the ages of 40-65 years old. Men are encouraged to be more health conscious of their decisions at the age of 40 and should get routine prostate exams with their primary healthcare provider. In the laboratory, experiments are being performed with Murine Tramp-C1 prostate culture cells. With these cells the rate at which cells grow within the body can be monitored. Incorporating healthy foods, exercise, and zinc into the male diet with prostate cancer has been proven to reduce Prostate-Specific Antigen (PSA) levels. 20 mg of Zinc is essential to men with prostate cancer because it supports chromosome integrity and is considered a “survival mineral”. The purpose of this research is to determine if Zinc has a direct effect on the growth of cells within the body. Murine cells were grown under normal conditions of 37 deg-C and 5% CO<sub>2</sub>. Inverted light microscopy and the MTT colorimetric assay was used to assess the growth of the cells. We will present data showing cells treated and not treated with the vitamin Zinc.

## 7. ARFGEF localization and function in *S. pombe*

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Melanie L. Styers

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AL 35226

Membrane trafficking is essential for eukaryotic cells to deliver proteins and lipids throughout the cell. Our goal is to characterize the function of GTP Exchange Factors (GEFs) and ADP Ribosylation Factors (ARFs) in *S. pombe* and better understand the relationship between these two types of proteins in membrane trafficking. We hypothesized that both *sec71p* and *sec72p* localize to the trans-golgi network (TGN), where they activate *arf1p* to regulate secretory and/or endocytic transport. However, analysis of *sec71* and *sec72* gene deletion strains revealed no changes in secretion or endocytosis. Microscopy showed localization of *sec71p* at the cell surface and *sec72p* at puncta consistent with the TGN. Analysis of BFA sensitivity and of localization of *arf1p* and *arf6p* in *sec71Δ* and *sec72Δ* strains suggest that *sec71* may directly or indirectly activate *arf6p* at the cell surface, while *sec72* activates *arf1* at the TGN. These results provide evidence for a novel separation of function for *sec71p* and *sec72p* in fission yeast.

## **8. Dopamine linked to stress tolerance and reproductive performances in *Drosophila melanogaster***

Nekia Ricks<sup>1</sup>, Mary Jane Krotzer<sup>1</sup>, Janis O'Donnell<sup>2</sup>, and Ananthbandhu Chaudhuri<sup>1</sup>

<sup>1</sup>Department of Natural Sciences, Stillman College, Tuscaloosa, AL 35403

<sup>2</sup>Biological Sciences, University of Alabama, Tuscaloosa, AL 35487

Dopamine (DA) serves as a neurotransmitter in a variety of organisms and controls several important physiological activities in humans. It has been reported that dopaminergic physiology is affected as a consequence of stress and affects the female sexual receptivity and ovarian development in *Drosophila*. Two different mutant flies, *catsup*<sup>1</sup> (produce high dopamine) and *pu*<sup>222</sup> (produce less dopamine) were used to study the effect of dopamine on stress tolerance and reproduction. The flies *w1118* were used as wild type control. The mature female flies (5-6 days old) were exposed for intermittent starvation stress for every alternating day till day 10. We found that intermittent starvation make the flies stress tolerant irrespective of mutations in DA synthesis pathway. Also, intermittent starvation stress alters the reproductive performance and produce differential number of offspring's depending on the DA level in mutant flies. Thus, we hypothesized that dopamine plays a significant role in stress tolerance and overall reproductive function. The downstream targets of dopamine for stress tolerance and reproductive development upon stress need to explore.

## 9. Uncovering Tomorrow's Medicine: The Search for New Antibiotic Cures in Dirt

Renosha Barlow, Guadalupe Meza, Haley Turner, and Mustafa Morsy

Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

Death toll of bacterial infections reaches 13 million per year, some of which are due to antibiotic resistant bacteria. It is estimated that the global cost for treatment of such infection will hit \$100 trillion by 2050; therefore, discovery of novel antibiotics is critical. As soil microbes are the main source of antibiotics, UWA joined forces with the Small World Initiative to discover novel antibiotics within Alabama's soil.

Soil samples were collected in triplets from an oak tree, an area around a pond, and the base of a giant cane patch. One gram of soil was used to isolate bacterial colonies by suspending it in sterile water. Soil extracts were plated on Petri dishes containing LB media, isolation of single bacterial colonies, and then screening for antibiotic production against *Escherichia coli* and *Acinetobacter baylyi*.

The abundance of soil bacteria varied significantly ranging from 31 to > 1,000 colonies with 5 to 17 different phenotypes based on soil sample. Screening of three 96-well plates containing unknown bacteria for formation of inhibition zones yielded 30 antibiotic producing bacteria. Further testing of the unknown bacteria against 4 other pathogens revealed pathogen specificity.

We are performing Polymerase Chain Reaction followed by DNA sequencing of the r-RNA gene to identify the unknown bacteria. We aim to identify all antibiotic producing bacteria at molecular and physiological level by the end of class.

Our search of novel antibiotics has the potential to serve as an important step towards finding a cure for some very serious bacterial infections.

## **10. The Effects of spinach extract on the Growth of Murine Tramp-C2 Prostate Cancer Cells using the MTT Assay**

Hanin Baatiyyah, Janis Beard, and Jeffery Merida

Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

Prostate cancer is the most common cancer among men. About 6 out of 10 men who develop prostate cancers are older than 60. The prostate is a gland that is found in only men; it is located in front of the rectum and under the bladder. Murine Tramp-C prostate cultured cells are used to perform experiments at conditions in which cells grow. These cells are generally used for research on prostate cancer. Once at a certain age, men are encouraged to be mindful of their health and aware of their dietary habits. Studies have shown that men who supplement their diet with **spinach** can significantly reduce their levels of prostate-specific antigen (PSA). Spinach carotene combats prostate cancer. There are several components that, previous studies have shown, reduce metastasis in prostate cancer cells. The purpose of this research is to determine if **spinach extract** has a direct effect on the growth of these cells. In this research, the murine cells were grown under normal conditions of 37 deg-C and 5% CO<sub>2</sub>. These cells were assessed for their growth using the MTT colorimetric assay for cell viability. We present data showing the effects in the growth of cells treated and not treated with **spinach extract**.

## 11. Fungal Symbionts Improve Tomato Production

Aries Larkin, Joy Carroll, and Mustafa Morsy

Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

California is an agricultural powerhouse. The state accounts for 15% of national sales and 7.1% of livestock, according to the California Department of Food and Agriculture. In 2015 alone, the state has seen a \$2.7 billion dollar revenue loss along with about a 10,000 job position decline in the agricultural setting. Genetic manipulations, agrochemicals, and classical breeding significantly improved crop production. However, increased production using these methods is not adequate to meet the future demands. In additions, these methods have adverse environmental effects and political stipulations.

Microbial symbionts can provide an effective and ecofriendly alternative to improve crop stress tolerance and production. The aim of this study is to discover beneficial fungal endophytes present within wild plants growing under harsh environmental conditions, and then apply it to crop plants to increase stress tolerance and production. Our survey of 20 wild plants yielded 67 endophytic fungi belonging to 46 genera. We tested the role of eight fungal isolates in improving tomato growth and production. Six weeks old symbiotic and non-symbiotic tomato plants were grown under drought or salinity stress for 6 weeks followed by 10 weeks of optimum conditions. The endophytes *Ampelomyces* and *Penicillium* proved effective in conferring positive benefits to tomatoes placed under stress as well as under normal growing conditions. *Ampelomyces sp.* conferred tolerance to tomatoes placed under drought stress in addition to enhancing overall plant growth compared to non-symbiotic plants. *Penicillium* conferred salt tolerance to tomatoes placed at 300 mM salinity in addition to enhanced root biomass compared to non-symbiotic plants. These data suggests that both *Ampelomyces* and *Penicillium* share promising potential for improving future agricultural production.

## **12. A study of Ginkgo Sarcotesta**

Kesia L. Smith, Caitlin M. Moore, and Yunho Kim

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Livingston, AL 35470

The Ginkgo biloba tree is well known in the health food and alternative medicine industries. The seeds and leaves of the tree have been researched for many years because of the medical properties attributed to them. There is a long folk history of using Ginkgo Biloba in the treatment of blood disorders and memory problems and its extracts are marketed as dietary supplements in the treatment of hypertension, dementia and Alzheimer's disease. However, the seeds also contain the toxin 4-O-methylpyridoxine (MPN), so consumption is normally limited to a few seeds daily. However, there has been very little research done on the sarcotesta (the fleshy covering around the seed) of the fruit. The long chain alkylphenols (ginkgolic acid), Bilobol and Adipostatin A have been linked to the allergenic, skin-irritating effects the sarcotesta. This research examines other polar and semi-polar compounds extracted from the sacrotesta for potential medicinal purposes. We plan to continue our research in order to separate and identify all major essential oils present in the sarcotesta.

### **13. Reserpine alters dopamine homeostasis and induces oxidative stress: *Drosophila melanogaster* a model system to study the human diseases**

Elizabeth Caver<sup>1</sup>, Mary Jane Krotzer<sup>1</sup>, Janis O'Donnell<sup>2</sup>, Natraj Krishnan<sup>3</sup>, and Ananthbandhu Chaudhuri<sup>1</sup>

<sup>1</sup>Department of Natural Sciences, Stillman College, Tuscaloosa, AL 35403

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<sup>3</sup>Department of Biochemistry, Molecular Biology, Entomology and Plant Pathology, Mississippi State University, MS

Reserpine is a common drug used to treat symptoms of hypertension as well as mental disorders in patients with schizophrenia. It is a crystalline alkaloid of rauwolfia with side effects ranging from mild dizziness and headaches to adverse chest pains, fainting, and depression and even leading to suicide. Reserpine is known to be an inhibitor and acts by blocking the receptors of the vesicular monoamine transporter (VMAT) in dopamine (DA) synthesis pathway. It is also believed to exhaust catecholamine storage which depresses the nerve functions and thus causes decreased heart rate and lowered blood pressure.

In this experiment we seek to identify how reserpine alters dopamine functioning and is a causative agent of oxidative stress using *Drosophila melanogaster* as a model system to study the human diseases. In the present experiment flies with different mutations in DA synthesis pathways (*Catsup1* produce high DA; *Pale2* produce low DA and VMAT having deficiencies in transport function) were fed with 15mM reserpine over 48hrs. The flies with no mutation (*w1118*) were used as the control. During the observational period we found that reserpine fed flies movement activity decreased and eventually ceased. Protein carbonyls were measured in order to assess levels of oxidative stress induced by the reserpine. The results affirmed the elevated levels of protein carbonyls in flies fed with reserpine. A stress tolerance test was completed with the simultaneous feeding of reserpine by scoring the mortality and the detailed results will be discussed.



## 14. Pathogens vs. Unknown Bacteria: A Search for Novel Antibiotics

Barclay Ables, Mallory Warren, Vicky Ames, and Mustafa Morsy

Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

Annually in the United States, at least 2 million people are infected with antibiotic resistance bacteria, and at least 23,000 people die each year because of these infections. The discovery of novel antibiotics over the past few years have been scarce. In addition, new antibiotic resistant bacteria are evolving. Therefore, there is a dire need for the discovery of novel antibiotics to treat these infections. Most antibiotics were discovered during the 1950s and 1960s, which is known as the “golden age of antibiotic discovery.” At UWA, our goal is to discover new antibiotics, which can be used to cure serious infection such as Methicillin-resistant *Staphylococcus aureus* (MRSA). Since most antibiotics used were discovered in soil bacteria, we tested soil samples from Alabama and Mississippi for antibiotic producing bacteria. We screened about 300 bacterial colonies and obtained 16 colonies producing antibiotics against *Escherichia coli* and *Acinetobacter baylyi*. We are currently testing these bacteria against safe relatives of ESKAPE pathogens, a particular group of bacteria that are aggressively pathogenic, actively evolving drug-resistance.

We plan to identify antibiotic producing bacteria using molecular and physiological techniques. Then we plan to identify the chemical structure of the antibiotic produced by each bacteria using gas chromatography technique. Performing an authentic research project enabled us to learn more about biological procedures and methods and allowed us to attempt to make an impact on antibiotic discovery.

## **15. The Effects of Vitamin D on Cancer Cell Viability Using the MTT Assay**

Dwight C. Herlong, Fatimah Alhassan, and Jeffery Merida

Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

Men have a significantly increased chance of prostate cancer as they reach the age 40. Murine Tramp-C prostate cultured cells are used to perform experiments at conditions in which cells can. These cells are universally used in research for prostate cancer. Once at a certain age, men are encouraged to be mindful of their health and aware of their dietary habits. Studies have shown that vitamin D may be a silver bullet. Vitamin D has several other functions in the body. Studies have revealed men that increase vitamin D in their diet can notably diminish levels of prostate-specific antigen (PSA). However, excess vitamin D can lead to other health-related diseases. There are several components that, previous studies have shown, reduce metastasis in prostate cancer cells. The intention of this investigation is to establish that vitamin D can have significant effects on the growth of these cells. During the course of the experimentation, the murine cells were grown under normal conditions of 37 deg-C and 5% CO<sub>2</sub>. The cells were grown in DMEM essential nutrients medium. For preventive measures, the cell medium was reinforced with penicillin/streptomycin antibiotics cocktail to reduce the chance of contamination. Bovine insulin was also added to the medium to stimulate the development of the cells. An inverted light microscope was use for assessment of the cells' growth and the MTT colorimetric assay for cell viability. We will present data showing the effect of the growth of cells treated and not treated with vitamin D.

## **16. Identification and Molecular Characterization of a High Light-sensitive *Chlamydomonas reinhardtii* mutant, 10E35**

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Photo-autotrophic growth under different light irradiances is modulated by a complex interplay of various physiological processes. *Chlamydomonas reinhardtii* is a model green micro-alga for studying eukaryotic oxygenic photosynthesis. Attributes such as a haploid genome, short replication time, autotrophic and heterotrophic growth ability, amenability to nuclear and chloroplast transformation, and a completely sequenced genome make it a model system for photosynthesis studies. Our laboratory has generated a mutant library of *Chlamydomonas* by random insertional mutagenesis using the pBC1 vector. This vector contains the *APHVIII* gene that confers resistance to paromomycin. The mutant library was screened under heterotrophic, mixotrophic, and photo-autotrophic growth conditions under different light intensities leading to the isolation of 20 mutants. One of the isolated photosynthetic mutants is *10E35*. Mutant *10E35* fails to grow under high light in both mixotrophic and photo-autotrophic growth conditions. *10E35* can grow photosynthetically on solid media plates but not in liquid culture. Adapter-based PCR was performed on *10E35* genomic DNA. The sequencing of the PCR products revealed two insertion sites of pBC1 in *10E35*. One pBC1 insertion site is in a novel functionally uncharacterized gene namely Cre11.g467757. The second insertion site of pBC1 is in Cre02.g095095. Cre02.g095095 codes for a secretory cell wall protein pherophorin-C12 (PHC12). The specific functional role of PHC12 is unknown to date. In green algae pherophorins are known to play a role in sexual mating process and are involved in various stress responses. We will be presenting our physiological and molecular research on *10E35*.

## **17. Hypoxic coma as a strategy to survive inundation across ground hunting arachnid taxa.**

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One ramification of climate change is the selective pressure placed on organisms to acquire physiological adaptations that ameliorate the effects of increased environmental fluctuation. Ground hunting spiders constitute a major arthropod group that inhabit habitats inundated by water during heavy rainfall events. This inundation is expected to become more frequent with climate change. Taxa which have the ability to enter into a hypoxic coma during inundation, thus avoiding drowning, should be better prepared for increases in extreme weather events. We compared the survivorship of ground hunting arachnids utilizing a hypoxic coma when exposed to inundation, to investigate the conservation of the trait across these taxa. The highest survivorship through hypoxic coma was found in *Dolomedes scriptus*; however, all of the species, with the exception of *Rabidosa punctulata*, had individuals' exhibit hypoxic coma as a survival strategy. Baseline respiration and respiration during hypoxic coma were determined to quantify the suppression of aerobic respiration.

## **18. The effects of Turmeric on cancer cell viability using the MTT assay**

Jawaher Almuqbil, Janis Beaird, and Jeffery Merida

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Prostate cancer is a cancer that begins in tissues of the prostate gland. Located just below the bladder and in front of the rectum, the prostate is the male sex gland responsible for the production of semen. In addition, prostate cancer is highly prevalent in African American men ages 40-69. Murine Tramp-C prostate cultured cells are used to perform experiments at conditions in which cells grow. These cells are generally used for research on prostate cancer. Once at a certain age, men are encouraged to be mindful of their health and aware of their dietary habits. Studies have shown that men who have a diet with **turmeric** can prevent reduce their levels of prostate-specific antigen (PSA). The purpose of this research is to determine if turmeric has a direct effect on the growth of these cells. In this research the murine cells were grown under normal conditions of 37 deg-C and 5% CO<sub>2</sub> for 7 days. The cells were grown in DMEM medium. To deter contamination, the cell medium was supplemented with a penicillin/streptomycin antibiotics cocktail. To stimulate the growth of the cells, bovine insulin was also added to the medium. These cells were assessed for their growth using inverted light microscopy and the MTT colorimetric Assay for cell viability. We will present data showing the effects of turmeric on the growth of these cells.

## **19. Human Tear Lysozyme Effectiveness**

Kesia Smith and Tracy Keener

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Human tears play an important role in the bodies' innate immune system. Tear fluid provides protection for the external surface of the eye by diluting, flushing out, or neutralizing foreign material and chemicals. Lysozyme is an enzyme that breaks down bacterial cell walls and provides protection against bacterial invasion in the skin, mucous membranes, and many body fluids. It is found especially in tears, preventing infection in the eye. Participant tears will be collected through two different stimulation processes: self-stimulation (emotional) and exposure to a pen light (irritant). Tears will be analyzed for lysozyme effectiveness through spectrophotometry. Results from both stimulation processes will be compared to determine if there is any difference in the effectiveness of tear lysozyme.

## **20. Mitigation of Health Effects due to Climate Change**

Sydney Melson, Shakira Young, and Ketia Shumaker

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The goal of this project was to evaluate and explore associations between plant physiology and gene expression in three different tree species: Green Ash (*Fraxinus pennsylvanica*, Marsh.), Poplar hybrids (*Populus maximowizii x trichocarpa*), and Sugar Maple (*Acer saccharum*, Marsh.). These species were exposed to three levels of ozone (80, 125, and 225 ppb) in greenhouse fumigation chambers. Plant physiology assessments were conducted at 14-day, 21-day and 28-day intervals after exposure initiation using a Li-Cor 6400 open-gas exchange system with an internal light source (Li-Cor Inc., Lincoln, NE), which provided measurements for photosynthesis and stomatal conductance. Genes from the ascorbate family [ascorbate peroxidase (APX2, APX3, APX 6)] and genes involved in the photosynthetic activity (PSAA, PSAB, PSAB) were investigated because of their known response to oxidative stress. Gene expression was studied through real-time quantitative PCR (RT-qPCR) for four plants/ozone-treatment for each plant species undergoing ozone exposure. The results from this study will provide insight into possible associations between plant physiology and gene expression among the targeted tree species exposed to ozone.

## **21. Fighting Antibiotic Resistant Bacteria: The Search for Novel Antibiotics**

Darnella Cole, Abby Coley, Jonathan Atkins, and Mustafa Morsy

Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

In the US, 30,000 people die annually due to antibiotic resistant bacteria (ARB). In the last 40 years, unnecessary prescriptions of antibiotics to humans and farm animals led to the development of many ARB such as MRSA. To cure these ARBs, novel antibiotics are needed. However, pharmaceutical companies are not invested in the discovery of novel antibiotics, rather interested in medicine that is more profitable. Therefore, the Small World Initiative (SWI) is leading the search of novel antibiotics by crowdsourcing student efforts from around the world, including the UWA BOSS Scholars. Almost 75% of known antibiotics were found in soil bacteria and fungi. Our target is to test various soil samples from Alabama in order to find novel antibiotics. Bacteria were isolated from the soil and plated on LB agar media, and grown at 34°C for 16 hours. More than 3,000 bacterial colonies were obtained. We tested 300 bacterial colonies against *Escherichia coli* and *Acinetobacter baylyi* to check of any inhibition zone, an indication of antibiotic production. Eight unknown bacteria were effective in inhibiting the growth of the tested pathogens. We further tested these eight unknown against four other pathogens. The unknown antibiotics were effective on some pathogens, but not on all. These results indicate a specificity of the antibiotics produced. Our research findings could potentially help save numerous lives lost to antibiotic resistant bacteria. Additionally, novel antibiotics can save about \$35 billion that is expected to cost the economy due to care of patients infected with antibiotic resistant bacteria.



## **22. The effects of Omega-3 fatty acids on cancer cell viability using the MTT assay**

Fatimah Alhassan, Janis Beard, and Jeffery Merida

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Prostate cancer is the most common cancer among men in United States. The risk of prostate cancer increases as men get older. Murine Tramp-C prostate cultured cells are used to perform experiments at conditions in which cells can and cannot grow. These cells are generally used for research on prostate cancer. By the age of 40, men are encouraged to be mindful of their health and aware of their dietary habits. There are many factors that could cause prostate cancer such as genes, age and diet. Diet is the only choice that men could control to prevent prostate cancer. Studies have shown that men who supplement their diet with omega-3 fatty acids can significantly reduce their levels of prostate-specific antigen (PSA). There are several components that, previous studies have shown, reduce metastasis in prostate cancer cells. The purpose of this research is to determine if  $\alpha$ -linolenic acid (ALA), docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) have a direct effect on preventing the proliferation of these cells. These cells were assessed for their growth using inverted light microscopy and the MTT colorimetric assay for cell viability. Using the MTT colorimetric assay helps us to determine the viability of cells by measuring the activity of mitochondrial enzymes only found in living cells. We will present data showing the difference in the growth of cells treated and not treated with a variety of omega-3 fatty acids.

### **23. Antibiotics: Diamonds in the Dirt**

River Tompkins, Mantricia Densmore, Megan Black, and Mustafa Morsy

Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

In the hunt for new antibiotics to fight the threat of antibiotic-resistant bacteria that threatens at least 2 million people in the United States, the University of West Alabama (UWA) has joined forces with the Small World Initiative (SWI) in hopes of finding a novel and effective new antibiotic against these bacteria. Since more than 75% of antibiotics were discovered in the soil, our focus is on isolating bacteria from the soil in order to discover new antibiotics. We examine soil from different areas in Alabama. We tested 400 bacterial colonies from soil samples against several pathogens, including *Staphylococcus epidermidis* and *Pseudomonas putida*. We observed which bacteria produces antibiotics to fight off pathogen by looking for inhibition zone when the pathogen co-cultured with the unknown bacteria. As a group, we obtained five antibiotic producing unknown bacteria. We are in the process of testing these bacteria against other pathogens and identifying these bacteria. For bacterial identification, r-RNA of each bacterial isolate will be amplified using Polymerase Chain Reaction, gel electrophoresis, and finally DNA sequencing. This experiment has not only benefitted us as students but as biological science majors by gaining the skills to perform accurate research and experimentation. We have also made an effort to help the scientific research community with this project as well as the medical field.

## 24. The Biological Fight between Soil and Antibiotic Resistant Bacteria

Baylee Tindol, Jade Montgomery, Da'Sha Harrington, and Mustafa Morsy

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Worldwide misuse of antibiotics has contributed greatly to the development of antibiotic resistant bacteria, thus the risk of death from a simple infection. Antibiotic resistant bacteria were evolved in response to the overuse of antibiotics prescribed by physicians for common cold, flu, and other viral infections, which cannot be treated with antibiotics. Many scientific reports associated the death of nearly 23,000 people annually to antibiotic resistant bacterial infection. Our goal is to discover novel antibiotics that can be used to treat antibiotic resistant bacteria. As most of the commercially available antibiotics were discovered in soil microbes, we hypothesize that testing various soil samples will lead to discovery of novel antibiotic producing bacteria. We isolated about 2,000 single bacterial colonies with more than 20 distinctive phenotypes by plating soil extract on LB media. We tested 300 bacterial colonies for antibiotic production against *E. coli* and *Actinobacteria baylyi*. We obtained 15 antibiotic producing bacteria, 5% of the total tested bacteria. We further tested the antibiotic producing bacteria against 4 other safe pathogens. Antibiotics produced were effective on some pathogens, but not on others. Our current research is focused on identification of antibiotic producing bacteria using rRNA Polymerase Chain Reaction followed by DNA sequencing and other physiological tests such as Gram staining. This research-based class expanded our knowledge of scientific inquiry and the antibiotics resistant crisis. Additionally, this course unites undergraduates from around the world under common goal of discovering new antibiotics, which will allow UWA students to develop future collaboration with biologists worldwide.

## **25. The Effects of Exercise-Induced Bronchoconstriction (EIB) On Oxygen Deficit and Oxygen Debt in Athletes and Non-Athletes During Exercise**

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Intro: Exercise-induced bronchoconstriction (EIB) is a chronic disease that causes airway restriction. EIB may be a genetic abnormality or caused by excessive high intensity aerobic exercise. EIB is devastating to athletic performance.

Purpose: To investigate the effects of EIB on oxygen deficit and oxygen debt in athletes and non-athletes during exercise.

Methods: 8 college students were divided into two groups: student-athletes with EIB and sedentary individuals without EIB. Study was approved by IRB and informed consent was sought. Standard anthropometrics were measured. Subjects ran on a treadmill for 15 minutes. Oxygen deficit was recorded by taking heart rate every 30 seconds for 5 minutes to determine heart rate plateau. Immediately after exercise, heart rate (oxygen debt) was recorded every 30 seconds until resting heart rate was achieved.

Stats: Data were presented as mean  $\pm$  standard deviation. *T*-Test determined differences in resting heart rate, exercise heart rate, and post-exercise heart rate. Analysis were performed using SPSS software (SPSS version 20, 2015). Statistical significance was  $p < 0.05$ .

Results: There were no significant differences in heart rates between the groups. However, athletes' initial exercise heart rate (oxygen deficit) plateaued at a lower heart rate compared to the sedentary group. Post-exercise heart rates (oxygen debt) declined faster in athletes vs sedentary.

Discussion: While there were no significant differences in oxygen deficit and oxygen debt between the groups, athletes had a lower rate of oxygen deficit in the beginning of exercise. EIB does not seem to effect athletes during exercise. Training may overcome EIB.

## **26. The effects of Green Tea on cancer cell viability using the MTT assay**

Alofi Amirah, Janis Beard, and Jeffery Merida

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The prostate is a gland found only in males which contains several types of cells. Some of these cells can develop into tumors. Prostate cancer is the most commonly occurring cancer among men of age 40-49. Usually Murine Tramp-C prostate cultured cells are used to perform experiments at conditions at which cells grow. These cells are generally used for research on prostate cancer. Once at a certain age, men are encouraged to be mindful of their health and aware of their dietary habits. Laboratory Studies have shown that a man who drinks green tea can significantly reduce the level of prostate-specific antigen (PSA). Green tea is a drink made from the dried leaves of an Asian plant. The extract from green tea contains a substance called epigallocatechin-3-gallate (EGCG). The purpose of this research is to determine if the extract of green tea can be effective against prostate cancer. Murine cells were grown under normal conditions of 37 deg-C and 5% CO<sub>2</sub>. The cells were grown in DMEM essential nutrients medium. These cells were assessed for their growth using inverted light microscopy and the MTT colorimetric assay for cell viability. We present data showing the effects of green tea extract on the proliferation of Tramp C cells.

## 27. Discovery of New Antibiotic Producing Bacteria

Cade Anderson, Katie Edmondson, Laura Wilson, Katelyn Young, and Mustafa Morsy

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The Small World Initiative (SWI) was developed at Yale University in 2012 by Jo Handelsman, who is now working as the Associate Director for Science at the White House Office of Science and Technology Policy. Over the past 3 years, SWI has connected with several universities in pursuit of discovering new antibiotic producing bacteria. Often, doctors prescribe antibiotics for illnesses such as the common cold, sore throats, and the flu. Every time a person takes antibiotics; sensitive bacteria are killed, but other bacteria can develop a resistance to the antibiotics. Discovery of new antibiotics will help in saving 23,000 lives that die annually in the United States due to antibiotic resistant bacteria. The University of West Alabama has contributed to the SWI efforts by testing soil samples from diverse areas, such as local nature trails and around the campus, for antibiotic producing bacteria. Soil bacteria were isolated on LB media, and then each student screened 95 bacterial colonies for antibiotic production against common pathogens such as *Escherichia coli* and *Antinobacteria bayly*. We obtained 10 bacterial colonies that inhibited the pathogen growth. Several other pathogens were also tested against the known bacteria producing antibiotics. The bacteria producing antibiotics that were able to fight off any of the pathogens can be used in future research; each new discovery is one-step closer to a cure. This experiment has provided us with experience, research, and hands-on learning in the lab, while also providing us with the opportunity to benefit our community.

## **28. The effects of fennel seed extract on cancer cell viability using the MTT assay**

Aljohani Areej, Janis Beard, and Jeffery Merida

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Prostate cancer is a disease which only affects men. Cancer begins to grow in the prostate—a gland in the male reproductive system. This gland is located below the urinary bladder and in front of the rectum. Prostate cancer is highly prevalent in men ages 40-69. Murine Tramp-C prostate cultured cells are used to perform experiments at conditions in which cells grow. These cells are generally used for research on prostate cancer. Once at a certain age, men are encouraged to be mindful of their health and aware of their dietary habits. Studies have shown that men who supplement their diet with fennel seed can significantly reduce their levels of prostate-specific antigen (PSA). There are several components that, previous studies have shown, reduce metastasis in prostate cancer cells. The purpose of this research is to determine if fennel seed extract have a direct effect on the growth of these cells. In this research the murine cells were grown under normal conditions of 37 deg-C and 5% CO<sub>2</sub>. These cells were assessed for their growth using inverted light microscopy and the MTT colorimetric assay for cell viability. We will present data showing the difference in the growth of cells treated and not treated with fennel seed extract.

## **29. The physiological effects of *Triadica sebifera* on *Rhinella marina***

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*Triadica sebifera*, commonly referred to as the Chinese Tallow tree, is a native tree species to Southeast Asia that is invasive to much of the Southeastern part of the United States. Field observations have been made that where there is a large density of *Triadica sebifera* there is a low density of amphibians. Previous studies have shown that Chinese Tallow tree leaf litter does have a negative effect on amphibian larvae growth and survival. However, to our knowledge no studies have been performed to understand the physiological effects of Chinese Tallow trees on adult amphibians. In order to understand this relationship our group designed an experiment that looks at the immunologic effect Chinese Tallow trees have on adult *Rhinella marina* (Cane toad, n=30). Our study utilized three different water types (water from a Chinese Tallow infiltrated pond, water from a pond without Chinese Tallows, and then normal tap water). Toads were divided into 3 experimental groups (n=10/group) and each group was given free access to one of the 3 water sources. Blood samples were collected weekly for 9 weeks and tested for phagocytic activity, novel antibody titer, and white blood cell counts. Exposure continued and at 20 weeks of exposure the toads were tested again weekly, for four weeks to measure chronic exposure.



### **30. The Effects of omega-3 fatty acids on the Growth of Murine Tramp-C Prostate Epithelial Cancer Cells using the MTT Assay**

Myesha Terrell, Fatimah Alhassan and Jeffery Merida

Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

Prostate cancer is the second leading cause of cancer-related deaths among men in the United States. There are numerous treatments available for those who have been diagnosed with prostate cancer to include; but not limited to, surgery, radiation, and cancer medication. Like most, those forms of treatments have unwanted side effects. Studies have shown a more natural and healthy way to prevent and treat prostate cancer is to intake fish that are high in omega-3 fatty acids such as salmon, trout, and fresh tuna in their daily diet. It is believed that consumption of fatty fish might reduce the risk of prostate cancer. The importance of our research is to determine whether or not fatty acids contained in fish inhibit the growth of prostate cancer in Murine Tramp-C prostate cultured cells. In this research the Murine cells were grown under normal conditions of 37 degrees Celsius and 5 percent CO<sub>2</sub> for 7 days. The cells were grown in RPMI essential nutrients medium while bovine insulin was also added to stimulate the growth of the cells. These cells were assessed for their growth using inverted light microscopy and the MTT colorimetric Assay for cell viability. We present data showing the effects of omega-3 fatty acids on prostate cancer cells.

### **31. Characterization of the Venom Proteome for the Wandering Spider, *Ctenus hibernalis* (Aranea:Ctenidae)**

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Spider venom is a rich multicomponent mixture of neurotoxic polypeptides. The venom of a small percentage of the currently classified spiders has been categorized. We constructed proteomic data from crude venom of the wandering spider *Ctenus hibernalis* using HPLC paired with LTQ XL ion MS, to determine what venom proteins are expressed in this species. We found 1,238 proteins that closely matched the sequences of other venom proteins of several species of spiders. Our results suggest that the venom proteins of *C. hibernalis* contain several proteins with conserved structures similar to other species. Future work will further characterize the sequences of the proteins that did not have any matches within the database in order to further understand the proteomic makeup of the venom of this species.

## **32. Effects of Energy Drinks on Stress Tolerances and Movement Behavior of *Drosophila melanogaster*: Dopamine synthesis pathway a significant target of energy drinks**

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Energy drinks (ED) are a type of beverage that contains stimulant drugs. Excessive consumption of ED can lead to restlessness, agitation headaches, or even insomnia. Present experiment reports the effects of ED on movement behavior and stress tolerance using *Drosophila melanogaster* as a model system. As neurotransmitter dopamine (DA) regulates the movement behavior and stress tolerance in human and other organisms, we are interested to find out whether ED affects DA synthesis pathway in fly models. The flies that have mutations in different DA synthesis pathway (*catsup1*: produce high DA and *pale2*: produce low dopamine) are used for this experiment to discover the possible link. We fed two most commonly used energy drinks, red bull (RB) and 5 hour-energy drinks (5hrED) to see the effects on survival, stress tolerance and movement behavior in fly model. Both of the drinks are different in chemical ingredients. However, the most common ingredients are caffeine, taurine, glucuronolactone, ginseng etc. A sucrose solution of 27% alone was used as the control. Only female flies were used for this experiment and fed the ED continuously for 6 days to record the mortality and movement behaviors.

We found that movement behavior significantly altered upon feeding of both the EDs irrespective of mutations in DA signaling pathway. The flies became very slow to cross a 5 centimeter distance and dopamine mutant flies differentially responded to the energy drinks. The 5hr ED is very toxic compared to RB and killed almost 50% of the fly within 6 days during the course of feeding of ED. We also found that the flies produce high DA became more stress tolerant compared to the control and low DA flies. Thus, we hypothesized that both the ED could have a significant link with DA synthesis pathway and could lead to toxicity. Further studies are under progress to confirm the link.

### **33. The effects of broccoli extract on cancer cell viability using the MTT assay for cell viability**

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Cancer is a disease in which cells in the body grow out of control. When cancer starts in the prostate, it is called prostate cancer. Except for skin cancer, prostate cancer is the most common cancer in American men. The prostate is a part of the male reproductive system, which includes the penis, prostate, and testicles. The prostate is located just below the bladder and in front of the rectum. It is about the size of a walnut and surrounds the urethra (the tube that empties urine from the bladder). It produces fluid that makes up a part of semen. As a man ages, the prostate tends to increase in size. This can cause the urethra to narrow and decrease urine flow. This is called benign prostatic hyperplasia, and it is not the same as prostate cancer. Men may also have other prostate changes that are not cancer.

The supplement that we use in this research is broccoli. Previous researchers have found that broccoli has a substance called sulforaphane. This substance has been implicated as a causative agent in the prevention of prostate cancer. It can switch on genes that fight cancer and prevent genes that can enhance it and help it to spread. What is impressive is that just four serving per week of broccoli can protect men from prostate cancer. We present data showing the effects of a broccoli extract on the proliferation of murine prostate cancer cells.

### **34. Sources of *E. coli* in Little Lagoon**

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*Escherichia coli*, more commonly known as *E. coli*, is a bacterial strain found in the intestines and fecal matter of humans and animals. It is a pathogenic bacterium that can cause illness if transmitted through contamination of food or water. Concerns arose for members of the Little Lagoon Community in Gulf Shores, Alabama when high levels of *E. coli* were detected in their waters. To prevent infectious disease, the sources of *E. coli* were tracked. Water samples from Little Lagoon and its surrounding water bodies were taken. Fecal samples from local wildlife were also collected. The locations tested included Site 0, Site 1, NE canal, NW canal, SE canal, Gator Lake, Middle Lake, Little Lake, Oyster Bay, and the GSPMB plant. The collected bacterial samples were grown and assayed using antibiotic susceptibility techniques. By utilizing PCA, phenotypic patterns in animals were compared to our results to conclude whether or not *E. coli* could be traced back to human sources. This study found that 24% of the total *E. coli* samples could be assigned to human sources based on their antibiotic resistant profile.

### **35. The Effect of Birmingham's Urban Heat Island on Moth Phenology**

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Urban cities retain more heat than rural areas, especially at night. This is called the urban heat island effect. Warmer temperatures have also been shown to increase the metabolic rates of ectotherms such as insects. In this study the impact of temperature on moth phenology was assessed by tracking the emergence time of adult moths at three different Birmingham locations that had different levels of urbanicity. Sixteen focal species were used. Temperature loggers at each site demonstrated Birmingham to have a heat island of 1-3 °C warmer on average than the surrounding rural areas. The focal species were predicted to have emerged earliest at locations with greater urbanicity. Most of the focal species that were analyzed followed our prediction, however, a few species emerged latest at the inner city location. Our study mimics the effects global warming could potentially have on moth emergence and behavior by using space-for-time substitution. Understanding the effects of global warming on various species will be vital in order to maintain ecosystem stability in the future.

### **36. The Effects of Ganoderma Lucidum Mushroom Extract on the Growth of Murine Tramp-C Prostate Epithelial Cancer Cells using the MTT Assay**

Laila Ghazwani, Janis Beard, Jeffery Merida

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Prostate cancer is a cancer that found in the man's prostate gland. It is one of the most common types of cancer that afflicts men who is over 40 ages. Prostate cancer can be treated if it is detected at an early stage. However, if the detection is too late, it may be fatal. One of the most popular ways to research and study prostate cancer is using the murine Tramp-C prostate cultured cell line. In our research, we are using various dietary supplements to determine if they have an effect in the prevention of prostate cancer. Ganoderma Lucidum is a type of mushroom found in China. Men in China are encouraged to eat this mushroom to help prevent prostate cancer. The main purpose of this research is to determine if Ganoderma Lucidum may have a direct effect on the growth of murine Tramp-C cells. In this research, murine cells were grown under normal condition of 37 °C and 5% CO<sub>2</sub>. The murine Tramp-C prostate cultured cells were assessed for their growth using inverted light microscopy and the methylthiazol tetrazolium assay (MTT assay). We will present findings that will show the effects in the growth of cell treated and not treated with a Ganoderma Lucidum extract.

### **37. The effects of cabbage extract on cancer cell viability using the MTT assay**

Khulud Althiyabi, Janis Beaird, and Jeffery Merida

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Prostate cancer is the most type common of cancer in American men especially African American men. One in six men will have prostate cancer during his life. The prostate gland is one part of the male reproductive system. It secretes prostate fluid which is one component of semen. Murine Tramp-C prostate cultured cells are used to perform experiments at conditions in which cells grow. These cells are generally used for research on prostate cancer. Once at a certain age, men are encouraged to be mindful of their health and aware of their dietary habits. Studies have shown that men who supplement their diet with cabbage can significantly reduce their levels of prostate-specific antigen (PSA). There are several components that, previous studies have shown, reduce metastasis in prostate cancer. The purpose of this research is to determine if cabbage extract has a direct effect on the growth of these cells. Cabbage contains antioxidant like vitamins A and C and phytonutrients such as lutein. In this research, the murine cells were grown under normal conditions of 37 deg-C and 5% CO<sub>2</sub>. These cells were assessed for their growth using the MTT colorimetric Assay for cell viability. We will present data showing the difference in the growth of cells treated and not treated with cabbage extract.



### **Tri-Beta Biological Honor Society**

The Beta Phi Chapter of Beta Beta Beta is the sole biological honor society at The University of West Alabama. Beta Beta Beta is a society for students, particularly undergraduates, dedicated to improving the understanding and appreciation of biological studies and extending boundaries of human knowledge through scientific research. As such, Tri-Beta is one of the nation's most respected biological honor societies. The Beta Phi Chapter of Beta Beta Beta National Biological Honor Society was chartered at The University of West Alabama in 1999. Since that time, Beta Phi has installed over 150 regular members of Beta Beta Beta. The members of Tri-Beta at UWA are active in undergraduate research, as well as service to the university community. The organization introduces and orients students to the numerous biological disciplines through guest speakers, shadowing opportunities, volunteer activities, and working on undergraduate research projects.

### **Alpha Epsilon Delta**

Alpha Epsilon Delta (AED) is a national health pre-professional honor society dedicated to the encouragement of scholarship and recognition of excellence. Pre-professional areas of interest include medicine, dentistry, veterinary and other similar health fields. The AED chapter at The University of West Alabama was chartered in 2010. Some of the benefits or membership are public recognition of outstanding scholarship, activities which promote interests in professional health, and establishment of contacts with health professionals. Requirements for membership are overall and science GPA's of 3.2 or higher. The science GPA includes biology, chemistry, physics and mathematics.

### **Science Saturdays**

The College of Natural Sciences and Mathematics (NSM) at the University of West Alabama initiated the *Science Saturdays* outreach program in 2010. The program aims to acquaint area K-12 students to the exciting field of Science and Mathematics at an early age. The

program provides students in elementary, middle, and high schools in and around Sumter County, Alabama, with opportunities to experience hands-on learning activities in science. *Science Saturdays* activities are two-hour events held three times during each fall and spring semester. Faculty members from UWA host science exploration projects through a variety of activities such as, "What Went By?" to learn how to trace animal footprints, ""Crime Scene Investigation series" to learn about fingerprinting and DNA analyses, and "Dr. Frankenstein" to learn about human anatomy. *Science Saturdays* activities are free of charge and are open to all children in the appropriate age groups advertised for each event. There is, however, a limit of 20 children per activity. Since the program started, over 500 K-12 students from 6 surrounding counties have participated in the program. Please visit the *Science Saturdays* website for more information and pictures of activities.

<http://www.uwa.edu/ScienceSaturdays>

### **Science Coffee Shop**

In 2013, the College of Natural Science and Mathematics, in coordination with the Center for the Study of the Black Belt, initiated the Science Coffee Shop series. These informal gatherings, hosted by The Coffee Shop on Monroe, provide an opportunity for UWA faculty and other scholars to meet with community members in a casual atmosphere and discuss a wide range of science topics. Science Coffee Shops have generated community-wide discussions about producing new crops adapted to climate change, the microbiology of beer, the BP oil spill and Alabama marine life, and others. Please visit the Science Coffee Shop website for more information and pictures of activities. <http://mmorsy.wix.com/science-coffee-shop>

### **Science Olympiad**

Since 2004, the College of Natural Science and Mathematics has hosted the UWA Elementary Science Olympiad. This is an academic interscholastic competition for Grades 3-6 consisting of a series of individual and team events for which students prepare throughout

the year. Participating students interact with one another, learn subject matter, and have fun with science. Participation in Science Olympiads has been directly linked to increased interest and achievement in science and math. Events in the ESO relate directly to National Science Education Content Standards and to Alabama Content Standards for Science.

### **West Alabama Regional Science Fair**

The West Alabama Regional Science Fair is an Intel ISEF-affiliated fair serving the counties of Choctaw, Fayette, Greene, Hale, Lamar, Marengo, Marion, Perry, Pickens, Sumter, and Tuscaloosa. These competitions exist in nearly every state in the United States as well as in 40 foreign countries. All Intel ISEF-affiliated science fairs register with Society for Science and the Public and must consist of five participating high schools and/or 50 students in the ninth - twelfth grades. The 2014 West Alabama Regional Science Fair will sponsor a winning student's travel to the 2014 International Science and Engineering Fair to be held in Los Angeles, California from May 11 - 16, 2014. Each year, millions of students worldwide compete in local and school-sponsored science fairs; the winners of these events go on to participate in Intel ISEF-affiliated regional and state fairs from which the best win the opportunity to attend the Intel ISEF. The Intel ISEF unites these top young scientific minds, showcasing their talent on an international stage, enabling them to submit their work to judging by doctoral level scientists—and providing the opportunity to compete for nearly \$4 million in prizes and scholarships.

### **UWA BOSS**

UWA Biology Opportunities and Scholarship for Success (BOSS) is a program funded by the National Science Foundation, NSF. The program provides scholarships for academically talented students demonstrating financial need, enabling them to enter the STEM workforce or STEM graduate school following completion of a baccalaureate degree in biology. The UWA BOSS provides more than

monetary support for student participants. As part of the project, students also partake in undergraduate research that better prepare them for the work force or for graduate studies. Students engage in professional development activities and peer mentoring, while also having a faculty mentor who works closely with them as they assume the rigorous curriculum.

### **STEM Freshman Seminar**

UWA 101 (Freshman Seminar) is a required course for all entering freshmen. As biology, math, science, or computer science majors, students have the opportunity to take a special UWA 101 courses designed specifically for them through the UWA Project Engage Program funded by a Minority Science and Engineering Improvement Program grant from The United States Department of Education. In addition to the regular UWA 101 course content, such as campus resources, personal, social, and academic support skills development, and expanded university orientation, the STEM (Science, Technology, Engineering, and Mathematics) UWA 101 course integrates specific STEM-related content and provides students access to enhanced educational technology resources.

### **UWA's Project Engage**

UWA's Project Engage is a capacity-building program designed to increase the retention rates of students. It is aimed at underrepresented groups majoring in science, technology, engineering, or mathematics (STEM), and focuses on their freshman and sophomore years through intensive academic and personal mentoring. A second purpose of Project Engage is to increase graduation rates of STEM students through their continued participation in project activities during the second year and beyond.

### **The Alabama Onsite Wastewater Association Training Center**

The Alabama Onsite Wastewater Association Training Center (AOWATC) was established in 1997 because of a growing need for

education in the rapidly changing wastewater field. The organization is dedicated to expanding public awareness of water quality issues, with a particular emphasis on wastewater management. The center was established with funding from the United States Environmental Protection Agency through the Alabama Department of Environmental Management, and by donations from the University of West Alabama and other contributors. The center is a member in a partnership that includes many federal, state, and local agencies, including the Alabama Onsite Wastewater Association, the Tombigbee Resource Conservation and Development Council, the Alabama Department of Public Health, the Alabama Onsite Wastewater Board, the Alabama Soil and Water Conservation Committee, and the Sumter County Soil and Water Conservation District.

### **Sumter County Nature Trust**

The Sumter County Nature Trust was established in 1985 through a gift from Doctors Ralph and Margaret Lyon, both UWA Professors Emeriti. The Lyons, who lived in Sumter County for over thirty years, chose this avenue as a means of expressing their love for the county, for nature, and for people. The Trust is committed to identifying and preserving the natural resources of Sumter County, informing citizens about such matters, sponsoring environmental education activities, and developing sites where citizens can enjoy and appreciate the environmental treasures of the Black Belt Region. Endowment income provides funds for activities initiated by the Trust, as well as matching grants for individuals and organizations interested in fulfilling the goals of the Trust.

### **Fossils of the Black Belt**

A one-day workshop on fossils for high school teachers is held each October, run by the University's paleontologists in partnership with researchers from the Geological Survey of Alabama. Continuing Education credit is offered.

## Participating Organizations

Alabama Power

Alabama College of Osteopathic Medicine (ACOM)

National Ecological Observatory Network (NEON)

Samford School of Pharmacy

UA Rural Health Scholars Program

UA School of Engineering

UAB School of Health Professions

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## Author Index

Page	Student (Last, First)	Mentor
14	Ables, Barclay	Mustafa Morsy
6, 22	Alhassan, Fatimah	Jeffery Merida/Janis Beaird
18	Almuqbil, Jawaher	Jeffery Merida/Janis Beaird
2	Alonazi, Laila	Jeffery Merida/Janis Beaird
37	Althiyabi, Khulud	Jeffery Merida/Janis Beaird
14	Ames, Vicky	Mustafa Morsy
26	Amirah, Alofi	Jeffery Merida/Janis Beaird
27	Anderson, Cade	Mustafa Morsy
28	Areej, Aljohani	Jeffery Merida/Janis Beaird
21	Atkins, Jonathan	Mustafa Morsy
10	Baatiyyah, Hanin	Janis Beaird and Jeffery Merida
9	Barlow, Renosha	Mustafa Morsy
23	Black, Megan	Mustafa Morsy
31	Buszka, Patrick A.	Robert A. Hataway
11	Carroll, Joy	Mustafa Morsy
13	Caver, Elizabeth	Chaudhuri Anathbandhu/Janis O'Donnell/Natraj Krishnan
21	Cole, Darnella	Mustafa Morsy
31	Cole, T. Jeffrey	Robert A. Hataway
21	Coley, Abby	Mustafa Morsy
1, 25	Cunningham, Kayla	James Robinson
35	Daugherty, Tyler J.	Pete Van Zandt
1, 25	Davis, Ashton	James Robinson
3	Deluca, Mara	Mustafa Morsy
23	Densmore, Mantricia	Mustafa Morsy
32	Dent, Shaquitta	Chaudhuri Anathbandhu/Janis O'Donnell
27	Edmondson, Katie	Mustafa Morsy
6	Fields, Kasabria	Jeffery Merida
36	Ghazwani, Laila	Jeffery Merida/Janis Beaird
35	Gregory, Sam D.	Pete Van Zandt
16	Grovenstein, Phillip	Mautusi Mitra
24	Harrington, Da'Sha	Mustafa Morsy
35	Harry, Brittany F.	Pete Van Zandt
15	Herlong, Dwight C.	Jeffery Merida

34	Hernandez, Kimberly	Brian Burnes
31	Hunsinger, Ronald N.	Robert A. Hataway
35	Hunt, Benjamin C.	Pete Van Zandt
1, 25	Jackson, Victoria	James Robinson
3	King, Riley	Mustafa Morsy
8, 13,		Chaudhuri Anathbandhu/Janis
32	Krotzer, Mary Jane	O'Donnell
7	Kuerten, Bethany G.	Melanie L. Styers
11	Larkin, Aries	Mustafa Morsy
16	Martinez-Feduchi, Paula	Mautusi Mitra
33	Maryam Aljaber	Jeffery Merida/Janis Beard
34	Matthews, Sydney	Brian Burnes
35	Medd, Alec M.	Pete Van Zandt
20	Melson, Sydney	Ketia Shumaker
9	Meza, Guadalupe	Mustafa Morsy
31	Mobley, James A.	Robert A. Hataway
24	Montgomery, Jade	Mustafa Morsy
12	Moore, Caitlin M.	Yunho Kim
27	Morsy, Mustafa	Mustafa Morsy
1, 25	Mosley, Zach	James Robinson
4	Nemeth, James	Jeffery Merida
7	Newcomb, Avery L.	Melanie L. Styers
16	Nguyen, Kevin	Mautusi Mitra
29	Rawls, Brittney R.	Chelsea Ward/Sue Thomson
		Chaudhuri Anathbandhu/Janis
8	Ricks, Nekia	O'Donnell
1, 25	Robertson, Aisha	James Robinson
7	Robinson, Markia A.	Melanie L. Styers
29	Segars, Jonothon H.	Chelsea Ward/Sue Thomson
16	Senesca, Betkens	Mautusi Mitra
29	Smith, Gayle	Chelsea Ward/Sue Thomson
16	Smith, Katherine	Mautusi Mitra
12, 19	Smith, Kesia L.	Yunho Kim
29	Strozie, Amanda	Chelsea Ward/Sue Thomson
29	Swann, Christopher	Chelsea Ward/Sue Thomson
16	Swilley, Kasey	Mautusi Mitra
30	Terrell, Myesha	Jeffery Merida
24	Tindol, Baylee	Mustafa Morsy



23	Tompkins, River	Mustafa Morsy
16	Truong, Tai	Mautusi Mitra
9	Turner, Haley	Mustafa Morsy
5	Ufomadu, Ezekiel	Jeffery Merida
17	Ware-Gilmore, Fhallon C.	Robert A. Hataway
14	Warren, Mallory	Mustafa Morsy
27	Wilson, Laura	Mustafa Morsy
20	Young, Shakira	Ketia Shumaker

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