



9th Annual

University Research Symposium (URS)

March 10, 2020

Brock Hall | Bell Conference Center

University of West Alabama

Livingston, AL

Poster Sessions & Graduate School Expo
8:30 am – 5:30 pm

Venue: Brock Hall	
Registration, Poster Setup, and Breakfast	8:30 am-9:30 am
Poster Viewing/Judging Round 1, and Graduate School/Career Exhibition	9:30 am-11:30 am
URS Group Photo (bring sunglasses from swag bag!)	11:30 am
Lunch	11:45 am-1:00 pm
Graduate Presentations and Oral Presentations	1:00 pm - 2:00 pm
Poster Viewing/Judging Round 2, and Graduate School/Career Exhibition	1:00 pm - 3:00 pm

Venue: Bell Conference Center

Keynote Address and Awards

- Welcome
- Banquet
- Keynote Address
- Awards Ceremony

3:30 pm – 5:30 p.m.

ORGANIZING COMMITTEE

Dr. Mustafa Morsy, Chair

Dr. Jing Chen

Mrs. Hoda Hassan

Ms. Betsy Compton

Mr. Robby Johnson

Dr. King Tiong

SPONSORS



The Tombigbee RC&D mission is to carry out activities that accelerate the development, conservation and wise use of human, financial and natural resources in order to improve the standard of living within the area.

RC&D is a local nonprofit organization led by local community leaders initially started in the 1960's to address rural poverty, and to help rural communities generate sustainable natural resource-based economies. Although today many RC&D Areas are not rural and are not poor, the need for the RC&D concept is just as strong as ever.

RC&D is not the same-old, same-old – RC&D is collaborative, multi-leveled, action-oriented, and inclusive. And, sometimes, “RC&D” is difficult to explain and difficult to quantify. However, the effect of the RC&D approach to solving community problems involving local people in voluntary, empowering ways can be felt by almost every RC&D project that happens across the country.

SPONSORS

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Alabama Water
Institute

The University of Alabama established the Alabama Water Institute (AWI) in 2017 to build upon the strengths and excellence of campus programs in water-related research, education and innovation. The AWI focuses on basic and applied research efforts to sustain waterways, marshes, estuaries and coastal areas. It provides a forum for interdisciplinary research and education and brings together university researchers, students and staff to foster collaboration and a broad interdisciplinary focus on water issues that face our world today. AWI-affiliated researchers specialize in remote sensing, hydrological modeling, water quality, biodiversity, watershed management and human health through synergies with existing centers and the creation of new centers under the umbrella of AWI. To learn more about AWI, visit <http://awi.ua.edu>.



In the summer of 1930, Elton B. Stephens began selling magazines door-to-door in Birmingham, AL. Fourteen years later, after putting himself through undergraduate and law school, Elton and his wife, Alys, began what would become one of the largest privately held companies in the United States—EBSCO. Today, we operate businesses in a wide range of industries, from information services to manufacturing, and we employ 5800 people in 26 countries around the world. While we have grown in many ways, we continue to operate with the same entrepreneurial spirit and drive that originated with our founder.

OTHER SPONSORS & SUPPORTERS

- Alabama Power
- UWA Office of Sponsored Programs and Research
- UWA College of Natural Science and Mathematics
- Sumter County Farmers Federation

MESSAGE FROM THE PRESIDENT

I am pleased to welcome all students, faculty, staff and visitors to our campus for the 9th annual University Research Symposium being held March 10, 2020.

The URS is one of the most valuable experiential learning opportunities we can offer to our students, particularly undergraduates who are seeking to join graduate programs beyond UWA, or to enhance their career opportunities.



I was delighted to learn that many student authors are in attendance from UWA and other schools, as well as special guest from Mississippi State University, Alabama Water Institute, Alabama College of Osteopathic Medicine, University of Alabama, SAFE Center and the University of Alabama at Birmingham. I would like to welcome each of you to UWA and wish you the best in your endeavor.

I am pleased that this year's symposium features student presentations from all programs offered by UWA, including graduate programs. Such expansion should support the significant growth in our program offerings, such as the Ed. D. in Rural Education doctoral degree, and other new programs added in the last few years. We are proud of our growth and are happy to share the exciting accomplishments of our students, faculty and staff. I would like to congratulate all students and mentors for their efforts in developing such stimulating and diverse topics and research projects.

I also would like to welcome to campus the keynote speakers, Dr. Jim Purcell, Executive Director of the Alabama Commission on Higher Education and Mr. Rick Pate, Commissioner of the Alabama Department of Agriculture and Industries. We are looking forward to their inspiring presentations and discussion to motivate a new generation of successful graduates.

Finally, let me offer best wishes during your participation in this exciting conference and I hope that this will be the first of many more URS conferences on your research agenda.

Ken Tucker, Ph.D.

A handwritten signature in black ink that reads "Ken Tucker". The signature is written in a cursive style with a large, prominent "K" and "T".

President

MESSAGE FROM THE DEAN

In the College of Natural Sciences and Mathematics, we strongly believe in treating “science” as a verb. It’s not something you study – it’s something you do. We want our students to understand that their chosen field is much more than a collection of facts. It’s a process - a way of doing things. In light of this philosophy, we place great emphasis on involving our students in actual research.



When students engage in independent research under the guidance of talented faculty mentors, they gain insight into the process that can be attained in no other way. Immersion in the techniques of academic research provides undergraduate students with a deeper understanding of their academic fields and prepares them for success in their academic pursuits and future careers. The faculty of the College of Natural Sciences and Mathematics takes great pride in the diverse backgrounds and individual interests of our students. The excellent mentors in the College take pride in assisting research participants concentrate in their field of focus and refine the skills of scientific research. Since 2012, the College has sponsored the University Research Symposium (URS) on Assessment Day each Spring Semester. It has grown from a small group of students displaying their research posters in a classroom in Bibb Graves Hall to a collection of some of the most outstanding student researchers from around the state and beyond. On this day, we celebrate the year’s research efforts as students present the results of their research to a panel of judges and to the broader UWA community. Researchers from diverse disciplines highlight current and recent research projects, showcasing a wide range of topics, approaches, and interests. The URS also serves as a resource for other students not yet engaged in research pursuits. Such students can learn what sparked the intellectual interests of their fellow students, and how they can develop research projects of their own and nurture connections with faculty mentors. Finally, the URS has developed into an occasion for students, faculty, staff, prospective students, and alumni to celebrate the year’s student achievements and to witness how student projects enhance learning, support faculty members’ own work, and serve the greater community.

Dean John McCall

MESSAGE FROM THE CHAIR

In behalf of the organizing committee, it is my great pleasure to welcome you to the University of West Alabama's 9th Research Symposium (URS). I am happy to extend a warm welcome to students and visitors from other institutions.

The URS has played a vital role in advancing undergraduate research at the University of West Alabama (UWA) and we anticipate that the URS will greatly contribute to the experiences of our growing graduate student population as the University expands its graduate programs in various disciplines.

Educating students has always been the primary objective of UWA. We believe that the best way to achieve this is to expose our students to intellectually important questions through independent research and hands-on learning. The URS provides an accessible forum for students to display and promote their scholarly research. In addition, the URS provides students with opportunities to network with graduate and professional schools alongside industry representatives. I am thrilled that the URS exists to provide such opportunities not only for UWA students, but for students from colleges and universities all over the South.



Throughout the day, you will have the opportunity to meet colleagues and presenters, to discuss various ideas, and to expand your knowledge and network. We will conclude the day with wonderful words from the keynote speaker, Dr. Jim Purcell and Commissioner Rick Pate.

I look forward to meeting and working with every one of you to build a community of successful professionals in the region.

Enjoy your day.

Mustafa Morsy

Chair and Co-founder

KEYNOTE SPEAKER

James E. Purcell, E.D., was named the State Higher Education Executive Officer (SHEEO) of the Alabama Commission on Higher Education in April, 2017, having served previously as the SHEEO in Rhode Island, Louisiana and Arkansas.



Dr. Purcell is a strong advocate for institutional research and planning as a means to implement policies and programs related to higher education. This organized approach provides a blueprint for expanding access to higher education and improving student attainment. The transparency across the higher education system will be essential in responding to workforce needs in Alabama. During his career, he has secured grant funding from state, federal and private philanthropic organizations to support these goals, particularly for adult degree completions.

Dr. Purcell is a past president of the Southern Association for Institutional Research and a former member of the executive council of SHEEO.

The Alabama native holds an Ed.D. in Higher Education Administration from the University of Alabama, a M.Ed. in Counseling from the University of Montevallo and a B.S. in Public Administration from Auburn University.

Dr. Purcell has spent the past thirty years advocating for students and institutions of higher education to maximize their potential.

KEYNOTE SPEAKER

Rick Pate grew up working on his family's cattle and poultry operations in Lowndes County, where he learned the value of hard work and perseverance.

Because of his roots in agriculture, he studied horticulture and received his bachelor's degree in 1978 from Auburn University's College of Agriculture.



Pate put his degree and determination to work and started Pate Landscape Co., Inc. over 36 years ago. Under Pate's leadership, the company has been profitable and award winning. His focus on building relationships in the community through both professional and civic organizations and his commitment to install quality work are what Pate credits his success to. He plans to continue these philosophies during his service as Commissioner of Agriculture. Even though Pate has spent most of his time operating Pate Landscape, he never let go of his love for and connection to the farm in Lowndes County. He had a purebred Charolais herd of his own, but at the death of his father in 2012, he also took over the family cattle operation, Pate Charolais Ranch.

As if running a company and being a cattleman was not enough to keep him busy, Pate had been raised with the example that each of us has a responsibility to give back. In 1996, he had the opportunity to do just that by joining Lowndesboro's town council and later serving as mayor in 2004. During his term as mayor, a new well and water tank were added, the water system was expanded, and sidewalks were installed through town. These improvements will be enjoyed by the town's residents for years to come. He resigned his position as mayor after winning the run-off election for Commissioner of Agriculture and Industries in 2018.

Growing up on a farm, running a business, and serving as the mayor of a small rural town has given Pate a unique prospective to bring to the office of Ag Commissioner. He has a genuine concern for the future of agriculture and the people of Alabama.

Pate is mindful that by 2050, farmers will have to double food production to meet the needs of the world and that it will take visionary leaders who understand that we have to work smarter, not just harder, to achieve these goals. He plans to do his part by working with department staff, agriculture stakeholders and the people of Alabama to make a difference.

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1. Photoactive Nanoparticles-Loaded Bio-Nanofibers for Solar Vapor Generation

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Recently, implementation of solar driven vaporization for producing clean water has gained interest. Benefits of this technique include that it does not require water to reach its boiling temperature, can potentially be employed by both developed and undeveloped nations, and proposes a sustainable solution for overcoming water scarcity. However, low utilization efficiency of solar energy is currently a significant roadblock when it comes to the successful implementation of this technique. Photoactive nanoparticles used as solar absorbers has the potential to overcome said roadblock because they have demonstrated the ability to increase solar evaporation efficiency. This study aims to develop cellulose acetate (CA) nanofibers doped with CdSe nanoparticles as a solar energy conversion device and evaluate its performance in solar vapor generation. Preliminary experiments were conducted in order to determine the optimum electrospinning parameters, including CA solution concentration (12 wt%), flow rate (3 mL/h), voltage (12 kV), and spinning distance (8 cm), at which to fabricate the CA nanofibers. CdSe-loaded CA Nanofibers, with varying CA:CdSe ratios, were fabricated in order to determine the optimal CA:CdSe ratio for solar conversion efficiency. The fibers were characterized by scanning electron microscopy (SEM) for their morphology and X-ray diffraction (XRD) for their microstructural and phase properties. UV-visible spectrophotometry and Fourier-transform infrared spectroscopy (FTIR) was conducted to determine the transmittance and thus the sunlight absorption range. The nanofibers were further tested for solar vapor generation under 1 sun (100 mW/cm²) using an infrared (IR) camera. The CdSe-loaded CA nanofibers were shown as a feasible and promising hybrid material to achieve more efficient solar thermal conversion.

Keywords: photoactive nanoparticles; nanofibers; biopolymer; cellulose acetate; electrospinning; solar energy

2. Recent Developments in Electrospinning of Chitosan Nanofibers

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Electrospinning is a technique to fabricate micro- to nano-sized nonwoven fibers by stretching polymer melts or solutions in a high voltage electric field. Nowadays, electrospinning has become an attractive process due to its versatility, scalability, and unique properties of nanofibers. Chitosan is a highly abundant biopolymer derived from partial deacetylation of chitin, a polysaccharide found in the exoskeletons of insects and crustaceans, such as lobsters, shrimp, and crabs. Chitosan is a prime candidate for electrospinning into nanofibers due to its higher solubility than chitin, non-toxicity, biodegradability, abundance, antimicrobial and chelating properties. Yet, the rigid structure of chitosan does arise as difficulties, as it is not soluble in water and most aqueous systems. Certain organic solvents or their mixture with aqueous solvents are required. Improving the electrospinnability of pure chitosan by modifying electrospinning parameters, altering solvent systems, blending with other polymers, and even hydrolyzing chitosan prior to spinning were all attempted by various authors. To improve the mechanical and chemical stability of chitosan nanofibers, crosslinking agents such as glutaraldehyde and genipin, which stabilize chitosan through the coupling and bonding of their functional groups, were also employed. If successfully spun, chitosan nanofibers could be a useful material in wound dressing, bone tissue engineering, drug delivery, water and air filtration, solar panels, and food packaging. Hence, this is a review of recent reports on the preparation, characterization, and application of chitosan-based nanofibers.

3. Quenching mechanisms in the interaction of transition metal cations with fluorescent conjugated polymers

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Tuscaloosa, AL

Metal cations pose severe negative impacts on human health and the environment. Optical spectroscopic techniques such as UV-vis absorbance and fluorescence spectroscopy allow for an inexpensive, simple, and portable means to obtain data soon after sample collection. Measurements at the low concentrations relevant for environmental and biological applications, however, present a major challenge with this approach. Our group has been using conjugated polymers in a sensing array to differentiate divalent metal cations in solution. However, to further optimize these methods, we would like to learn more about the mechanisms leading to the modulation of the fluorescence emission.

These polymers contain a common fluorene core separated by conjugated spacer groups and a variety of pendant arms. Compared to small-molecule fluorophores, such conjugated polymers provide much greater analytical sensitivity through π -mediated signal amplification along the backbone of the polymer. We studied the binding of a series of four highly fluorescent polymers to metal ions to determine the quenching mechanisms in play. Structural motifs in each polymer can cause a significant change in its optical signature. A series of benchtop titrations was conducted on these polymers with seven divalent metal cations to determine the quenching mechanisms. These titrations gave us insight into how the different structural features interact with metal cations. Knowing how these metals quench the polymers will allow us to optimize our sensing system in the future.

4. Pollution in a Storm

Aaron Evans, Zavier Chaney, Brodie Townsend, and Kevin Morse

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Question:

How can storm water run-off influence the amount of pollution in aquatic environments?

Hypothesis:

We believe that environmental factors influence the amount of pollution run off in Lake LU.

Storm water run-off is a non-point source pollution that is very hard to control and can carry many types of pollutants. How can storm water run-off influence the amount of pollution in an aquatic environment? In this study we monitored three locations before, during, and after a storm event from August until November 2019. These locations were picked because we believed that the potential amount of storm water and nutrients would show great differences in levels. During our process we tested multiple water quality parameters such as dissolved oxygen, pH, conductivity, temperature, and turbidity as well as E.coli, phosphorus, and nitrogen. We found a few abnormal changes in our locations for example; during a storm dissolved oxygen was exponentially lower than the amount on any given sunny day and in some areas as low as 0.96mg/L. Due to the weather and storm water runoff, other factors such as turbidity, E. coli, and nutrients increased. In conclusion, our results proved that abiotic factors in our aquatic environments were highly affected by storm water runoff carrying unknown pollutants.

5. Isolation and Characterization of Microorganisms from Food Loss/Waste Sources

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In the last couple of years food wastage has become a serious issue in our society. The Food and Agriculture Organization (FAO) states that 1/3 of the food produced in the world will never be eaten; in 2010 in America alone over 90% of the food waste ended up in landfills. Food waste frequently happens from safety authorities, like the FDA and USDA, issuing mandatory recalls and food spoilage resulting from compromised conditions of transportation or storage at retailers. While food loss and waste has been well researched, the involvement of consumer behavior and handling has been understudied. Our purpose is to identify the different types of microorganisms that grow on wasted food. Sample were from the local markets or home consumers. Once the 8 samples were collected the microorganisms were cultivated on Plate Count Agar (PCA), Potato Dextrose Agar (PDA), and De Man, Rogosa and Sharpe Agar (MRSA) using a bead spreading method. Isolated microorganisms were quadrant streaked for purification. Subsequent 16S rDNA identification of pure isolates were carried out with an ABI 3730XL sequencer. Microbial diversity analyses for 8 food samples revealed a total of 37 morphologically diverse microorganisms represented from PCA (20), MRSA (13) and PDA (4) plates. Of these samples, two (i.e., bamboo pork and baked sweet potato) exhibited the highest microbial diversity (4 forms) in PCA and MRSA plates in relative to others. Further 16S rDNA analyses identified pathogenic (*Staphylococcus aureus*, *Listeria monocytogenes*) and non-pathogenic food contaminants (*Bacillus* sp.). Food loss and waste are alarming factors limiting agricultural production sustainability, economic/revenue growth, earth and human health. The consumer behavior factor on food loss and waste has been under attended. The current work will help uncover the microbial effect on food loss/waste and be able to develop recommendations to improve the ongoing issues of food loss/waste.

Keywords: food waste; food loss; microorganisms; sustainability; pathogenic contaminant

6. Enzymatic Digestion of Starch Inclusion Complexes with Alkyl Gallates

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The interactions between starch and phenolic compounds have a great impact on the physicochemical and nutritional properties of starch-containing foods. Certain phenolic compounds demonstrated inhibitory effect on starch digestive enzymes and thus retard starch digestion. Furthermore, some phenolic compounds may form inclusion complexes with starch, which may further retard starch digestion and glucose release. Starch inclusion complex is a specific non-covalent interaction between a host (i.e., starch, especially the linear amylose) and a guest molecule (e.g., a phenolic compound). Previously, we have demonstrated the inhibitory effect of gallic acid and a series of alkyl gallates on *in vitro* enzymatic digestion of starch and hypothesized that the inhibitory effect was partially due to the inclusion complexation between starch and alkyl gallates. Therefore, in the current study, we were to demonstrate the formation of amylose inclusion complexes with alkyl gallates and investigate the *in vitro* enzymatic digestibility profiles of the amylose-gallate inclusion complexes. Gallic acid, butyl gallate, and octyl gallate did not form inclusion complex with amylose. As a result, amylose precipitated and possibly retrograded, resulting in around 60% of resistant starch. Comparatively, gallates with longer chain length, including dodecyl gallate, hexadecyl gallate, and octadecyl gallate, were found to form inclusion complex. The slowly digestible portion of these amylose-gallate inclusion complexes significantly increased with alkyl chain length, which paralleled the increase in their thermal stability, specifically, dissociation temperature during heating. These results suggest that starch inclusion complexes contribute to the slowly digestible portion of starch, and thus may have potential in modulating glycemic response, as well as in sustained release of the guest compound.

Keywords: starch; amylose; gallic acid; alkyl gallates; phenolic compounds; slowly digestible starch

7. Inhibitory Effect of Ascorbic Acid on the *in vitro* Enzymatic Digestion of Raw and Cooked Starch

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Ascorbic acid, also known as vitamin C, was previously reported to inhibit pancreatic α -amylase, a starch digestive enzyme. A major implication of such inhibition is a slowed rate of starch digestion into glucose, which thereby reduces postprandial hyperglycemia. Accordingly, this study explored the inhibitory effects of ascorbic acid on the digestion of a high amylose maize starch that was either raw, cooked without storage, or cooked and stored for 24 h at freezing (-20oC), refrigeration (4oC), or room temperature (23oC). Resistant starch (RS) content, defined as the starch remained after 4 h of simulated *in vitro* enzymatic digestion, was measured for the starch samples. First, the inhibitory effect of ascorbic acid on the digestion of raw starch increased with its concentration, until it reaches a maximum inhibition. Ascorbic acid concentration at 6.25 mg/mL increased the RS content to 78.59%, as compared to the 52.24% RS content in the raw starch without ascorbic acid. Cooked starch contained significantly less RS than raw starch ($p < 0.05$). Additionally, storage at freezing and refrigeration for 1 day only slightly increased RS compared freshly cooked starch. Storage at room temperature did not exhibit this effect. Under all tested processing and storage conditions, the addition of ascorbic acid resulted in significantly increased RS content ($p < 0.05$). However, rather than enhancing RS content, the action of ascorbic acid is to directly inhibit the digestive enzymes. The combined effect of ascorbic acid with certain storage conditions more potently augmented RS than either ascorbic acid or cold storage alone. Overall, our results most strongly indicate that ascorbic acid may function as a glycemic modulatory agent beyond other important functions, and its effects persist under a variety of processing conditions.

Keywords: starch; digestion; storage; ascorbic acid

8. Repeated Retinoic Acid Treatments Modulate Adipose Tissue Development of Neonatal Rats Reared by Mothers Consuming a High Fat Diet

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Retinoic acid (RA), the active metabolite of vitamin A, is shown to be a regulator of adipose tissue (AT) development in adults. The aim was to assess the effects of repeated RA treatments on AT development of neonatal rats reared by mothers consuming a high-fat diet (HFD). Sprague-Dawley rats arrived on second day of gestation and were randomized to a normal-fat diet (NFD=25% fat) or a HFD (50% fat). Half of the pups delivered by mothers in HFD cohort received oral RA treatments. Specifically, on postnatal day 5 (P5) and P8, respectively, n=12 pups in HFD cohort received a RA dose (HFD+RA group). Remaining pups in HFD cohort (n=12; HFD group) and pups in NFD cohort (n=12; NFD group) received oil as placebo. Six hours after the dosing on P8, n=4 pups/group were euthanized. On P11 and P14, remaining pups (n=8/group) received their respective treatment. Six hours after the administration on P14, n=4 pups/group were sacrificed. On P17 and P20, remaining pups (n=4/group) received their respective treatment and were euthanized six hours afterwards on P20. Serum samples from P14 and P20 were analyzed for lipids and adipokines. At P8 and P14, no significant difference in body weight gain, white adipose tissue mass, and brown adipose tissue mass of pups was noted among groups. At P20, all three measures were significantly ($P < 0.05$) higher in the HFD than in the NFD group; RA treatment significantly lowered the measures. At P20, serum adiponectin and leptin were both significantly higher in the HFD than in the NFD group; RA treatment significantly reduced both concentrations. At P14 and P20, serum triglyceride was significantly higher in pups receiving RA. Repeated RA treatments exerted a regulatory role on AT metabolism and development of neonatal offspring from mothers consuming a HFD.

Keywords: Vitamin A; high fat diet; neonates; maternal obesity; adipose tissue

9. **“Saraswatharishtam”- an Ayurveda Preparation Rescue from Movement Disorder in fly model: A Search for Neuroprotective Compounds from a poly herbal Medicine**

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Parkinson’s disease is a progressive neurodegenerative disorder associated with severe loss of motor functions due to degeneration of dopamine neurons in the brain. The etiology of most cases of the disease is unknown. However, several studies have discovered many possible environmental triggers, Spectracide, a commonly used herbicide, being a major chemical of interest. Some Spectracide related health symptoms include skin diseases, kidney failure, reproductive dysfunctions, cancer and neurodegenerative diseases. This study entirely focuses on the possible neurodegenerative effects of Spectracide exposure using fruit fly a model system to study the human diseases. We are interested to know whether Saraswatharishtam (SWRT), a traditional brain tonic could be an effective treatment for Spectracide induced neurological defects. SWRT is an Ayurveda medicine, mixture of 18 different types of Indigenous plant extracts reported to be very effective for memory loss and several other neurological dysfunctions. We fed Spectracide (5%) mixed with 5% sucrose solutions to score the mortality and record negative geotaxis. Only 5% sucrose was used as vehicle. In another set of experiments, we pre-fed the flies with SWRT extracts prepared with the following different solvents n-hexane, dichloromethane, ethyl acetate, n-butanol, and remaining residue using rotatory evaporator. We observed that crude extract of SWRT rescued the flies from Spectracide induced movement disorders. So far, we used two of the five extracts of SWRT and found that N-Butanol extract has no effect on the fly in regard to rescuing from movement defects. However, Ethyl Acetate extract from SWRT showed promising results in recovery from Spectracide induced movement impairments.

We conclude that SWRT could have neuroprotective effect and may be useful for the treatment of neurological disorders. We are testing the effect of different extracts on movement anomaly caused by Spectracide. The experiment is in progress.

Keywords: Spectracide, Drosophila, Ayurvedic, Saraswatharistham, Neuroprotection

10. Isolation, Characterization, and Identification of Potential Antimicrobial and Dental Care Lactic Acid Bacteria from Dental, Farm Animals, and Produce Sources

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Probiotic lactic acid bacteria (LAB) are generally-recognized-as-safe (GRAS) food additives under FDA food additive regulations. They can be used for health and oral benefits. A common way to consume them is a chewable tablet. Documented and present findings have characterized probiotics from commercial, farm produce, human and animal fecal sources. These have consistently proven that LAB can function to improve food digestibility, shelf life, flavor, immune system, and/or oral health. However, these probiotics with multiple functions are understudied. In this study, our purpose was to identify potential antimicrobial peptide- and lactase-producing LAB in dental isolates, farm animals and produce. All these sources of LAB help improve lactose intolerance, oral health, and microbial food safety. Enriched LAB were screened for potential antimicrobial by using the sandwich overlay technique. Also, supplementing with the deferred antagonism indicator by using the overlay method was completed. Lactase and hemolysin activities of LAB isolates were evaluated using a modified disk-diffusion technique on agar plates containing X-gal (20 µg/ml) and sheep blood (five percent), respectively. 16S rDNA bacterial identification of isolated LAB was performed using an ABI 3730XL sequencer. A total of 31 sample sources were used for research. Out of 283 LAB isolates, 46 confirmed activities fighting against foodborne pathogens, dental caries, and dental-derived health concerned pathogens. This suggests that this group of probiotics can be utilized for subsequent investigations. Lactase activity analyses revealed that three of these 46 LAB isolates were potential lactose consumers. Subsequent work revealed that they were from alpha-hemolytic group. 16S rDNA analyses for these three LAB isolates identified human pathogen (1) and starter cultures (2). Using LAB in natural processing and preservation of food is an ongoing trend of improving food nutrition, shelf life, and safety in the food industry today. Our findings suggest a group of added-value LAB that may serve a greater benefit for multiple needs.

Keywords: Lactic acid bacteria (LAB); generally-recognized-as-safe (GRAS); dental care; pathogen; shelf life

11. Haemosporidians and Trypanosomatids of Deceased Birds

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Due to the increasing of global temperatures, it is becoming more apparent that birds are becoming carriers of more blood parasites. Host communities could be affected by increased prevalence of disease, heightening the risk of extinction for many already threatened species. To understand how host communities could be affected by changing parasite distributions, we need information on the parasites in relation to variables like temperature and rainfall that are predicted to be affected by climate change. We propose that through migratory pathways, the local birds of Alabama are contracting parasites that are not predominate in our local areas. An understanding of behavioral and migratory patterns is beneficial for helping us find these parasites. In order to create a more complete report of parasitism in wild birds of Alabama, we have salvaged deceased bird specimens around our local community (n = 17). Our salvaged specimens represent 14 different avian species and 3 different orders. We have preserved bird skins, taken tissue samples, extracted DNA, and performed polymerase chain reaction (PCR) to detect blood parasites including Plasmodium, Trypanosoma, Leucocytozoon, and Parahaemoproteus. Analysis of parasite genes will allow us to determine parasite prevalence and genetic similarity. We can also determine whether any of the deceased birds we collected died from parasitic overload, and which parasites, if any, are the most detrimental to the health of birds.

12. Annotation of novel genes in mycobacteriophage genomes

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Bacteriophages (phages) are viruses which infect bacteria in order to replicate. They are ubiquitous in the environment and are recognized as the most populous biological agents on the planet. The potential uses for bacteriophages in disease treatment, agriculture, and food safety are abundant. We discovered two bacteriophages, *OKaNui* and *DroogsArmy*, in soil samples. Both phages were isolated from the bacterial host *Mycobacterium smegmatis* mc²155. After purification of the phage lysate, we extracted whole genomic DNA. Entire genomes for both *OKaNui* and *DroogsArmy* were sequenced using Illumina Sequencing at the Pittsburgh Bacteriophage Institute. Mycobacteriophages can be sorted into clusters based on nucleotide similarity across the whole genome. *OKaNui* belongs to the A4 subcluster, the genome is 51,424 bp long, and there are 87 genes predicted by our initial auto-annotation. *DroogsArmy* belongs to the A7 subcluster, the genome is 53,254 bp long, and there are 84 genes predicted. We are annotating these genomes to manually determine the number of genes, the most appropriate start sites, and predicted functions. Many genes show homology with other, similar phages. However, we have identified one gene in the *OKaNui* genome and seven in *DroogsArmy* that do not match genes from any other phages. These genes are interesting because they represent two possibilities: genes that are novel or genes that were erroneously predicted by our algorithms.

13. Automatic Body Information Measurement from Smartphone Images

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A smartphone solution to quickly assess the body information is in need for clinic practitioners and football coaches in health tracking of patients and athletes. Develop a tool to automatically measure body information (height, waistline, hipline) from a single smartphone image of a person. We addressed two challenges: distinguishing background with human and optimizing software runtime on cellphone. We found that image gradient method showed good performance to distinguish the top point with clear background. However, the lowest point detection needs to be improved due to the impurity color of the ground. We modified bottom point detection by integrating gradient with ostu thresholding. For the waistline and hipline detection, we used an unsupervised learning method, the k-means clustering, to distinguish hands, body, and background. To migrate our algorithm to the Android device, we modified k-mean method using a process consist of eroding and canny detection to reduce the measure time for hipline measurement. We verified the robustness of our method by running tests on 16 smartphone images. We compared the mean error and standard deviation of the difference between human measured data from a customized human labeling software and automatic measured data. The height estimation has the lowest mean error ($0.158\% \pm 0.122\%$), while the waistline estimation has the highest mean error ($2.95\% \pm 2.3\%$). The runtime of the program on the computer has an average of 0.73s. The runtime on Android phones are longer, especially for waist estimation. We will further investigate how to shorten the runtime of the image. Also, we will work with kinesiology college to use our tool for body composition analysis.

Keywords: k-means, gradient, Ostu threshold, Image processing, MATLAB, Android

14. Mindful Eating Scores differ by Body Mass Index and Self-reported Health Status among College Students

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The prevalence of overweight and obesity continues to rise among college students. College students are also adopting mindfulness habits, such as yoga and mindful meditation, at higher rates than the general population. Mindful eating is a "non-dieting" approach that focuses on paying attention to the body's internal hunger and satiety cues, while enjoying the food without distraction. The purpose of this study was to understand whether mindful eating is related to weight and health status among college students. 690 college students participated in an online survey. The survey included: the Mindful Eating Questionnaire (MEQ), a validated global health questionnaire, self-report of weight and height, and demographics. Mindful eating was reported on a five point Likert scale where higher scores represented higher mindful eating practices. Multiple regression analysis was used to test for significant differences in mindful eating scores by weight status and health status after adjusting for demographics. Among respondents, 19.6% rated their health as fair or poor and 67.8%, 20.7% and 11.5% were classified as healthy weight, overweight, or obese, respectively. After adjusting for demographics, MEQ scores were significantly higher among students reporting their health as excellent/very good/good versus fair/poor (3.4 +/- 0.4 versus 3.2+/-0.4, $p<0.0001$). MEQ scores were significantly different between weight status categories where students in the healthy weight range (3.4 +/- 0.4) had significantly higher scores than their overweight (3.3 +/- 0.1, $p=0.003$) or obese counterparts (3.2 +/- 0.4, $p<0.0001$). Among college students, mindful eating scores were slightly higher for students at a healthy weight and reporting good health compared to their counterparts. Thus, mindful eating interventions may be an effective strategy for addressing overweight and obesity in a university setting.

Keywords: college students, mindful eating, health status, Body Mass Index (BMI)

15. Using fungi as a fertilizer to improve cherry tomatoes productivity

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Human population is expected to reach 9.1 billion by the year 2050, which will require an increase in the current food production by 70%. Therefore, adapting new more sustainable agricultural practices are crucial to meet that goal. The use of microbial inoculum, i.e. fungal endophytes, is one of the promising technologies to increase productivity and improve abiotic stress tolerance. Fungal endophytes are microscopic organisms that persist between plant cell tissues and cause no apparent symptoms. Our research objective is test the role of fungal endophytes in improving crop productivity. We used tomato as a model system to examine the role of 9 fungal endophytes may play in tomato production under greenhouse conditions. Nine different fungal endophytes were grown in 0.1X PD liquid media to cultivate mycelial cultures. A 20 ml of liquid cultures containing approximately 1×10^6 of mycelial cells were added to the 6" pots of 2 weeks old tomato seedlings to colonize the plants. We used 20 pots for each treatment. Tomato plants were cared for until fruit production and then fruits were collected, counted and weighted. The purpose was to determine if any of the nine fungi that colonized cherry tomato have a positive outcome on fruit production compared to non-symbiotic group.

The results concluded that treatments A56 and A45 are beneficial to tomato production and are able to produce more cherry tomatoes compared to non-symbiotic group. Out of the nine treatments, only one had negative effect on the fruit production. The average increase in productivity due to various treatments was 95% compared to none-symbiotic plants. For example, treatment A56 yielded had 72% more fruits compared to none-symbiotic treatment while B51 yielded a 34% increase in productivity. Our results show that fungal endophytes can be an effective technology to increase crop productivity to meet the needed demands.

16. Isolation of Halophilic Bacterium from Makai Deep Pure Sea Salt

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Edible salts have long been used in the food industry for not only the flavoring of foods but also in food preservation. While food storage advancements like refrigeration and vacuum sealing of products have decreased the need for salt preservation, it is still utilized today. Salt is known for its ability to reduce the growth of pathogens and other microorganisms that can result in spoilage of food products or illness. It does this by limiting the amount of unbound water available to be used by microbes and their chemical reactions. However, salt can also be the source of living microorganisms called halophiles that may affect human health especially the gut microbiome. In this project, in order to determine the microbial communities of edible salts, an investigation was done using a culturomics approach. Ten edible salts were purchased at the food store and dissolved in a solution and plated onto modified SMR2A medium. Makai deep pure edible sea salt showed growth of halophilic bacterium after 10 days of incubation. This halophilic bacterium was purified using plating techniques and further identified using biochemical tests and 16S ribosomal RNA sequencing.

Keywords: Edible salts, halophiles, gut microbiome

17. Spectracide, an Environmental Pollutant, Causes Parkinsonian Symptoms in Fly Model: Is Dopamine Pathway a Target for Spectracide?

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Extensive use of pesticides and herbicides worldwide leads to environmental pollution (water, land, and air) which causes severe health issues in humans and non target organisms. Parkinson's disease is often associated with the destruction of dopamine neurons and is one of the main targets for several pesticides. In relation to the development of movement disorders, Spectracide has been observed as a chemical of major interest due its negative health effect and has been banned in European Countries. However, The United States and some other countries still allow the use of these environmentally toxic herbicides. Spectracide has four known major ingredients and most of them have been found to have a significant soil half-life which leads to increased groundwater contamination. Present study focuses on the toxic effects of Spectracide on movement disorders using fruit fly (*Drosophila melanogaster*), a unique model to study human diseases. We treated flies with Spectracide during the juvenile stage (36-48 hours old larva) at the doses of 0.1%, 0.25%, 0.5%, 0.75%, 1.0%, and 5.0% to test the toxicity. Spectracide was mixed with normal fly food for the treatment while normal food without Spectracide was used as a control. We found that pupation rate and adult emergence declines in a dose dependent manner upon exposure to Spectracide with a significant ($p < 0.05$) decline in larval negative geotaxis. The flies that survived and emerged as functional adults showed significant ($p < 0.05$) movement defects with clear symptoms of hyperactivity in herbicide treated groups. Thus, Spectracide exposure caused significant movement disorders in flies including slow movement with a frequent falls during climbing which is a strong indication of Parkinsonian symptoms in fly model. To confirm the effect of Spectracide on cellular level we conduct flowcytometry analysis. FACS analysis using *Drosophila* late embryonic cells (S2) revealed that Spectracide drastically changes the physical and chemical characteristics of the cells and possibly interfere cell cycle in a dose dependent manner. Two-dimensional dot plots graph showed a significant shift of a majority of the cell populations with a drastic decline in DNA synthesis in herbicide treated flies. We hypothesized that the dopamine pathway could be a possible target for the Spectracide to cause movement disorder and the experiment is still in progress. In conclusion, Spectracide should be considered as an environmental pollutant due to its toxic effect with a controlled used of such pollutants.

18. Evaluation of Seafood from Retail Sources for the Potential Presence of a Novel Group of *Vibrio parahaemolyticus*, the root of persistent vibriosis outbreak.

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The state of viable but non-culturable (VBNC) microorganisms is one of the known limiting factors for an accurate diagnosis, and consequently, false documentation of *Vibrio* availability in the tested seafoods. Previous work suggests a heat-dependent enrichment method for the successful resuscitation of pathogenic *V. parahaemolyticus* from natural sources; however, its availability in retail frozen raw shellfish organisms is under explored. In this study, the presence of VBNC *V. parahaemolyticus* from retail frozen raw shellfish organisms were evaluated under the heated conditions adapted recently. A heated pre-enrichment (pre-enriched/heated) method was devised for an investigative isolation of VBNC *V. parahaemolyticus* from various retail frozen shellfish organisms. The pathogen was selectively cultured and isolated on buffered thiosulfate-citrate-bile salts-sucrose plates (TCBS). Using bead extracted DNA it was analyzed by 16S rDNA sequencing. Gene-specific PCR, urease and Kanagawa hemolytic analyses were employed for the virulence characterization of the isolates. Significant differential isolate resuscitation was determined for 17 biological and three technical tests using Student's *t*-test ($P < 0.05$). TCBS culture-based screening of these samples exhibited 14 green/dark green colonies, a representative color of *V. parahaemolyticus*, from pre-enriched only (8) or pre-enriched/heated (6) conditions, suggesting the availability of a novel group of *V. parahaemolyticus*, in which their resuscitation from VBNC state depends on a heated pre-enrichment step. Positive urease production and negative hemolysis formation were noted. The 16S rDNA (14) and virulence genes PCR (2) analyses of these isolates confirmed two TLH-positive *V. parahaemolyticus* isolates. False-negative administrative examinations are a root to detection errors in novel, or known pathogens carrying novel properties, thereby potentially contributing to the persistent vibriosis-associated hospitalizations. Present findings suggest the availability of a group of heat-dependent VBNC pathogenic *Vibrio* species from all shellfish sources (i.e., natural and retail sources) and a heat-dependent pre-enrichment method for the detection of this novel group of *V. parahaemolyticus*.

Keywords: *Vibrio*; Food safety; seafood; shellfish; viable but non-culturable (VBNC)

19. Food Management Practices among Employees at a Regional University

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It is estimated that 1.3 billion tons of food produced annually is discarded leading to trillions spent on economic, social, and environmental costs across the globe. Human error in production, packaging, preservation, home consumption, and home storage are major contributing factors in food waste. For the present study, we will examine usual behavioral reactions to spoilage, food handling behaviors, and food waste knowledge and practices. The first phase involves focus groups with UWA faculty, staff, and students to discuss the influences on their food management practices. In an approximately hour long session, participants are asked eight questions regarding the purchasing, storage, use and waste of produce, ready to eat items, and meat. Two additional questions are asked about food safety regarding strategies to determine when food has gone bad. A powerpoint of three images in various states of spoilage are shown for participants to discuss their visual perceptions of the food. Data collection is ongoing, but currently one focus group with four faculty members has been completed. The participants reported a median age of 37.5 years old, 75% were female, and defined food waste as throwing away unused food whether due to non-use, spoilage, or indifference. Participants were similar on food storage practices for produce, ready to eat items, and meat but there was variability in the most purchased type of food items. Smell was the most frequently reported method of determining food spoilage but the variability in leftover management was mainly driven by family preferences. Further themes will be highlighted and further implications of the work will be discussed.

Keywords: food practices, waste, spoilage, food safety

20. The College Decision Making Process: Perspectives from Undergraduates at a Regional Institution

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College students attending a postsecondary institution within a rural setting rely on various forms of social capital in order to influence their decision to attend and graduate from college. Families, local communities, and high school staff often encourage rural students to embark upon higher education. However, these same forms of social capital can also deter rural students from attending college. Familial obligations, perceived lack of high school preparation, and lack of financial resources are a few challenges faced by these students. For the present study, we will examine the socioemotional and educational barriers that are unique to the rural college student population. The first phase involves focus groups with UWA students to discuss the influences on their decision to attend college. In an approximately hour long session, participants are asked eight questions regarding the direct messages received about college in high school from the high school staff, friends, and family. Two additional questions are asked about the monetary impact on the decision to go to college. Data collection is on-going, but currently one focus group with six undergraduate participants has been completed. The participants reported a median age of 20.5 years old, 66.7% were female, and cost-effectiveness was the most reported reason for choosing UWA. Participants reported the most frequent contact with family, friends, and others occurred through texting, email, and social media platforms. When questioned about college discussion from high school teachers, counselors, and administration, responses were mixed. Each participant reported that their family, however, made it a point to discuss college. Additional themes will be highlighted and further implications of the work will be discussed.

Keywords: college, social capital, barriers, support

21. Ichthyofaunal evidence supporting a hypothesized stream capture event between the Tennessee and Mobile River Basins and implications on conservation

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Alabama and Tennessee exhibit the greatest freshwater biodiversity in the United States. The Tennessee River and Mobile River basins are physically divided, but historical and recent natural history collections reveal evidence for inter-basin transfer of aquatic fauna. We report recent collections of three cold-water fish species (*Etheostoma nigripinne*, *Chrosomus tennesseensis*, and *Rhinichthys obtusus*) from headwaters of the Locust Fork of the Black Warrior River, Alabama. The headwaters of the Black Warrior River and tributaries to the Tennessee River are in close proximity and our results suggest that these species may have colonized the upper Locust Fork either through avulsion of surface streams or flow diversion within the subterranean aquifer. We conducted preliminary genetic analyses using two mitochondrial genes (COI and *cytb*). Results suggest there are differences between the populations in the headwaters of the Locust Fork and the respective previously established distributions of each fish. Furthermore, we discuss the implications of these collections on the mechanisms that drive biodiversity, including how stream capture may have isolated these populations leading to potential speciation events. We outline further areas of investigation and conservation efforts.

22. Dietary Fiber Intake is Inversely Related to Serum Heavy Metal Concentrations among US Adults Consuming Recommended Amounts of Seafood: Results from the 2013-2014 National Health and Nutrition Examination Survey

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Heavy metals such as mercury, cadmium, and lead have profound deleterious effects on human health, with seafood being the primary source. Dietary fiber has been reported to bind heavy metals in animal models, thus promoting their excretion. However, little is known about the relationship between dietary fiber intake and blood heavy metal concentrations in adults consuming adequate amounts of seafood. To examine the effects of dietary fiber intake on serum levels of mercury, cadmium, and lead in US adults with recommended amounts of seafood consumption, secondary data analysis was performed using data from the National Health and Nutrition Examination Survey (NHANES) (2013-2014) with a final sample size of 422. Dependent variables were serum concentrations of mercury, cadmium, and lead; independent variable was dietary fiber intake; confounding variables included were age, gender, race, and ratio of family income to poverty. Statistical analyses including descriptive analysis, univariate analysis, and multiple regression were conducted by SAS 9.4 and SUDAAN 11.04. After adjusting for covariates, it was found that for every 10-gram increase in dietary fiber intake, both serum cadmium ($p = 0.0010$) and lead concentrations ($p = 0.0019$) decreased by 11.6%. No significant relationship was found between dietary fiber intake and serum mercury concentration. Non-Hispanic Asian adults generally had significantly higher serum levels of mercury ($p < 0.0001$), cadmium ($p < 0.0001$), and lead ($p = 0.0003$) compared to non-Hispanic White adults. Age was positively related to serum heavy metal levels ($p < 0.0001$). In conclusion, dietary fiber intake was inversely related to serum levels of cadmium and lead among US adults consuming recommended amounts of seafood, indicating the potential benefits of increasing dietary fiber consumption among certain populations and demographic groups.

Keywords: NHANES; dietary fiber; heavy metal; mercury; cadmium; lead

23. Anthocyanin-loaded water-in-oil-in-water emulsion: Preparation, stability and *in vitro* gastrointestinal digestion

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Anthocyanin, a natural water-soluble plant pigment, shows many beneficial effects on human health, such as antioxidant, anti-tumor and anti-inflammation properties. However, the application of anthocyanin in food and pharmaceutical industries is largely limited due to its poor storage stability and gastrointestinal bioavailability. In this research, anthocyanin-loaded water₁-in-oil-in-water₂ (W₁/O/W₂) double Pickering emulsions stabilized by octenylsuccinate quinoa starch (OSQS) were optimized, and their storage stability and *in vitro* gastrointestinal digestion were evaluated. Novel starch-based double emulsions as anthocyanin cargos were achieved at 2% (w/v of oil) of polyglycerol polyricinoleate concentration, the W₁/O volume proportion of 3:7, 6% (w/v of total volume) of OSQS concentration, and the volume proportion of (W₁/O): W₂=6:4 and 5:5. Confocal laser scanning microscopy results evidenced the formation of double Pickering emulsions, and the significant decreases in the encapsulation stability of anthocyanin were closely related to the increases in the droplet size induced by osmotic pressure. Less than 15% of anthocyanin in the double Pickering emulsions was released after incubated for 60 min under simulated stomach conditions; controlled-release of anthocyanin was observed during the 120 min of simulated intestinal digestion, consistent with starch hydrolysis data. This study provides a potential way of producing starch-based double Pickering emulsion as an effective carrier of anthocyanin for the purpose of intestinal-targeted delivery.

Keywords: Anthocyanin, double emulsion, octenylsuccinate starch, storage stability; intestinal-targeted delivery

24. Online Influencers' Impact on Generations Y and Z

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The digital revolution has unquestionably changed the way in which consumer society operates. Consumers are now more acquainted and informed more than ever before in the online marketplace, and this movement has posed a real threat to traditional methods of marketing communications (Accenture, 2017).

This research was inspired by the recent revolution of online influencers and their impact on the latest two generations of our time; generation Y and Z (Abou-Ragheb, 2016). This study aimed to investigate the impact of online influencers for generation Y and Z on purchase intention and brand attitude. The study examines the comparison between the older cohort of generation Y (roughly ages 21-28) and the younger cohort of Z (roughly ages 18-20).

Social media has given brands and influencers the ideal platform to interact, engage and ultimately exert influence on young consumers on both, a local and global scale. Therefore, online influencers are changing the way brands disseminate marketing messages (Forbes Agency Council, 2017).

A quantitative research approach was undertaken where collective administered and online surveys were conducted in which both generations participated in. The data collected from this research led to the emergence of several findings.

Drawing from these findings it is clear that the respondents sampled within this study have a positive connotation towards online influencers. The main finding concluded that online influencers have a profound impact on both generation Y and Z and in turn influence their purchase intention and brand attitude. Findings showed many similarities between these generational cohorts. It was also found that online influencers impact both the online and offline purchase decisions of young consumers.

25. Vitamin A Status in Neonatal and Weanling Rats Reared by Mothers Consuming Normal and High Fat Diets with or without Vitamin A Supplementation

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Vitamin A (VA, retinol) is an indispensable micronutrient for the development of neonates and children. Although the circulating level of VA is reported to be significantly lower in obese adults, it is unknown if maternal adiposity would influence the VA status of the offspring. The aim of this study was to investigate the effect of maternal high fat diet consumption with or without VA supplementation on the status and distribution of VA in the offspring. Sprague-Dawley rat mothers were randomized to a normal fat diet (NFD; 25% fat) or a high fat diet (HFD; 50% fat) on gestational day 5. Upon delivery of pups, half of rat mothers in the NFD or HFD cohort were switched to a NFD or a HFD both with supplemented VA (NFD+VA and HFD+VA), respectively. The other half remained on their diets without supplemented VA (NFD and HFD). At postnatal day 14 (P14), 25, and 35, pups (n=4 or 3/group/time point) were euthanized. Concentrations of VA in serum, liver, visceral white adipose tissue (WAT), and brown adipose tissue (BAT) were measured. Results showed that pups in non-supplemented groups possessed a normal serum VA concentration but a marginal liver VA status. At all time points, VA concentrations in serum and all tissues were significantly ($P<0.05$) increased in VA-supplemented groups compared to non-supplemented ones. However, at P14, serum VA concentration was significantly lower in HFD+VA than in the NFD+VA group. At P25, both the concentration and the mass of VA in liver and in WAT was significantly higher in HFD+VA than in NFD+VA group. In conclusion, maternal VA supplementation improved the VA status of the offspring, regardless of being added to NFD or HFD. However, maternal HFD consumption may potentially compromise the availability of functional VA in circulation by increasing its deposition in storage organs.

Keywords: Vitamin A; high fat diet; maternal supplementation; neonates

26. Image Super-Resolution using Generative Adversarial Network**Shengting Cao, and Yu Gan**

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Higher resolution is in unmet need during biomedical imaging as it could facilitate the diagnosis and treatment of multiple diseases. In particular, we extended current Super-Resolution Generative Adversarial Network (SR-GAN) from natural image processing to medical image processing. Develop a deep learning network to better the resolution of biomedical images and recover detailed morphological information. The general idea is to use both generator and discriminator in the deep learning network. Generator can learn the relationship between low-resolution (LR) image and high-resolution (HR) image and generate predicted HR images from LR images. The discriminator gives feed backs to the generator by using a classification model to justify whether the generated image is HR or not. Upon contesting between two networks, the result can converge to optimal output. To testify the network in a biomedical image, namely optical coherence tomography (OCT), we made following modifications. First, we concatenate single channel image to RGB image. Second, we selected and cropped the most texture details part for training. We validated our methodology in following setups: 100 and 300 images running 100 and 300 iteration. It was found that 100 images with 100 iteration (PSNR: 33.58dB) has the best PSNR, 100 images with 300 iteration (SSIM: 0.54) has the best SSIM. It indicates the amount of 100 images is enough for training. In addition, we found that our method has a better perceptual image quality than interpolation-based method. We could further simplify the network for single channel image scenario. We could try to apply SRGAN to spectrum domain to enhance the optical resolution to reduce the needs for expensive optical design.

Keywords: generative adversarial network; low resolution; high resolution; biomedical image

27. Visceral Adiposity Index and Adherence to the Dietary Approaches to Stop Hypertension (DASH) Diet among Older Adults: National Health and Nutrition Examination Surveys 2011-2014

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Visceral adiposity, also referred to as visceral obesity or central obesity, has been associated with an increased inflammatory physiological response and a significant risk of cardiometabolic disease. The visceral adiposity index (VAI) has been shown to be a reliable estimate of visceral adiposity, but little is known about its association with specific dietary patterns such as the Dietary Approaches to Stop Hypertension (DASH) diet, particularly in older adults. The purpose of this study was to investigate the relationship between adherence to the DASH diet and the VAI in older adults using a nationally representative dataset, the National Health and Nutrition Examination Surveys (NHANES) from 2011-2014. Cross-sectional data from 506 older adults were examined, and their dietary intake was evaluated using the Dixon's DASH diet index. Using multiple linear regression analysis, the relationship between VAI and DASH diet score was assessed while controlling for demographic variables. The results suggest a significant inverse relationship between the DASH diet and VAI ($p < .01$). Adherence to the DASH diet could be cardioprotective in part due to this inverse relationship with visceral adiposity. Practitioners can easily calculate the VAI and incorporate the results into visits with patients, and counsel them on adhering to the DASH diet.

Keywords: Cardiometabolic disease; DASH diet; visceral adiposity index; NHANES

28. An Aquatic Melting Pot: Mapping Genetic Homogenization Among Bullhead Minnow Populations of the Tenn-Tom Waterway

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The Tennessee-Tombigbee Waterway maintained by the Army Corps of Engineers through the use of various locks and dams, has greatly influenced the biodiversity of the Tombigbee River, altering its flow, increasing its range, and connecting it to the Tennessee River. Previously, the Tennessee and Tombigbee Rivers had not come into contact with each other since the early Cenozoic Era, giving the fish in these systems time to become distinct populations and species, from the ancestral fishes. This project investigates the genetic impact brought about by this hydrological change. The Bullhead Minnow, *Pimephales vigilax*, is the indicator species used for this project due to its broad range, low specificity, and relative abundance. The range of the Bullhead Minnow is largely the Mississippi River System; the Tennessee population had little, to no contact with the Mobile Basin population, until the construction of the Tenn-Tom Waterway. Thereby making the Bullhead Minnow suitable for study. The Bullhead Minnow is easily distinguished from other minnows due to its crowded pre-dorsal scales, dark caudal spot separated from the longitudinal streak, and a dark dorsal spot. Using the Bullhead Minnow is economically, and biologically more sustainable than other imperiled fishes. We collected minnows using traditional seining methods at boat ramps. Mitochondrial Cytochrome Oxidase I gene was sequenced along with Single Nucleotide Polymorphisms, SNP's, which were processed by Diversity Arrays Technologies. The mitochondrial and SNP data so far suggests a rapid change in genetic diversity within a short amount of time. After extensive collection along the Tennessee and Tombigbee Rivers, there emerged three populations, the Tennessee population, the Tombigbee population, and an introgressed population. The loss of diversity promised by the disruption of habitat, particularly riverine habitat, portends extinction in many of these events.

29. Starch Inclusion Complexes for Triggered and Extended Release of Aroma Compounds

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Amylose, the essentially linear component of starch, is well known to form inclusion complexes with a number of aroma compounds. Starch/amylose-aroma inclusion complexes have many potential applications, for instance, triggered and sustained release of aromas. In the present study, we employed our recently developed method of using pre-formed V-type starch to molecularly encapsulate aroma compounds, including menthol, limonene and thymol. We used starch of six different V-type crystalline structures, namely V6a, V6h, V7a, V7h, V8a, and V8h-types, to encapsulate menthol. The V6h was found to be the most effective type to form inclusion complex with menthol, and the XRD pattern of V6h shifted to V7h upon complexation. In vitro release studies suggested the coexistence of different binding mechanisms of menthol in the starch inclusion complex matrix that include non-specific physical adsorption on the surface of starch or in the amorphous phase, inter-helical entrapment, and specific intra-helical inclusion complexation. The presence of α -amylase significantly increased the release rate and the released amount of menthol from inclusion complexes within 2 h. Instrumental release measurements were then validated with temporal human sensory evaluation, where 56 consumers of chewing gum evaluated samples using a combination of temporal check-all-that-apply (TCATA) for the first 5 minutes, followed by discrete CATA every subsequent 5 min until 20 min. Preliminary data showed that different temporal patterns were found between the control and the inclusion complex sample, indicating that aroma-starch inclusion complexes modulate flavor release in a chewing gum application.

Keywords: Amylose; starch; inclusion complex; menthol; limonene; thymol.

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