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MISSISSIPPI
ACADEMY OF SCIENCES

Second Annual
Summer Student Science Symposium

Thursday, July 26, 2018

Mississippi State University
The Bost Conference Center
Starkville, MS 39762

Major Sponsors

Office of the Vice President for Research and Economic Development, MSU

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Cotton Incorporated

Bagley College of Engineering At MSU

Division of Agriculture, Forestry & Veterinary Medicine at MSU

University of Mississippi Medical Center

Symposium Chairs:

Dr. Sukumar Saha, Chair
saha.sukumar@ars.usda.gov

Dr. Jason Keith, Co-Chair
keith@bagley.msstate.edu

Dr. Scott T. Willard, Co-Chair
swillard@cals.msstate.edu

Dr. Ham Benghuzzi, MAS Divisional Advisor
hbenghuzzi@umc.edu

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Mississippi Academy of Sciences

Mississippi Academy of Sciences:

What We Do

Communication Among Scientists

Each year, the Academy holds an annual meeting to present addresses, symposia, workshops, scientific papers, and exhibits of interest to its members. Research is presented in divisional meetings as podium or poster format. The meeting provides an excellent forum for members to exchange ideas and information. MAS publishes abstracts of the presented papers as part of the meeting program and as a supplement to its annual Journal.

The Academy also publishes *Science in Mississippi* (the Journal of the Mississippi Academy of Sciences). *Science in Mississippi* contains news and articles of interest to members and the scientific community. The Academy also helps to coordinate and organize scientific seminars and symposia in Mississippi.

Science Education

The Academy encourages potential scientists, engineers, and mathematicians through its youth activities. MAS sponsors the Mississippi Junior Academy of Science and participates in the Westinghouse Science Talent Search and other science-related programs at several educational levels. A number of research awards and grants are also available from MAS. The Academy encourages science education activities and programs throughout the state and maintains a liaison with the Mississippi Museum of Natural Science.

Assistance to the Community

MAS provides an inventory of science and technology expertise within the state. This information is available to members, state government agencies, the state legislature and other appropriate organizations and institutions. When called upon by state government, the Academy also offers information and counsel concerning science-related problems.

Summer Student Science Symposium

Goal: The symposium is designed to bring student researchers (undergraduates and graduates) across all branches of science divisions to present their research findings through **poster presentations** and interact with their peers and the scientific communities; explore career opportunities; make personal contacts that can lead to job opportunities; receive information from potential employers; enhance communication and networking skills; establish professional relationships; find out about internships and job opportunities with companies, universities, and USDA-ARS.

Who Should Attend: Students conducting research in the areas of agriculture and plant sciences; molecular biology, pathology, entomology, genetics, chemistry, health sciences, outcomes and population, all divisions of engineering or related subjects are highly encouraged to participate and compete for prestigious awards. Exhibitors from local vendors, institutions, companies interested in recruiting young students for their programs are encouraged to participate in the symposium. There will be three levels of booth exhibits are offered:

- **Standard Booth $200**
- **Gold Booth $300**
- **Diamond Booth $500**

Awards and Recognitions: The first, second, and third place of poster presentations (Undergraduate and Graduate) will receive a Certificate and cash awards; and fourth, fifth, and sixth will receive Certificates; all student participants will receive honorable mention certificate from the Mississippi Academy of Sciences.

Poster Presentation Guidelines: All posters will be displayed in the Bost Conference Center at Mississippi State University, Starkville, MS 39762.

Authors will be expected to mount their posters on July 26th , between 8:00 and 11:00 am. Authors will be expected to display their posters from 11:00 am-to 4:00 pm (to avoid confusion please assist us by not removing your poster before 4:00 pm).

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Pushpins will be provided. Your space will be indicated by a number on the board, which matches your abstract number in the program.

Each standard poster display area will be 36" (H) x 48" (W). Please contact me if this approach and these dimensions do not match your already made poster.

From 9-12 there will be program event and followed by complementary lunch between 12:00-1:00 pm.

If you have questions, please contact any of the chairs in the brochure.

Program Committee Coordinators:

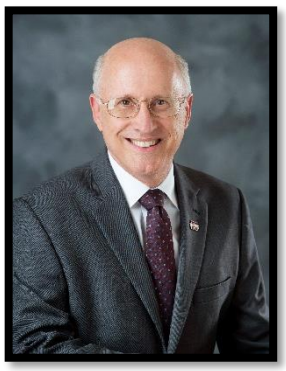
1. **Scientific Committee Coordinator:**
   Dr. Raja Reddy
   Mississippi State University
2. **Local Arrangement Coordinator:**
   Dr. Te-Ming Paul Tseng
   Mississippi State University
3. **Student Awards Committee Coordinator**:
   Dr. Michelle Tucci,
   University of Mississippi Med Center

Keynote Speakers:

Dr. David Shaw,

Vice President for Research and Economic Development, MSU.

Title: ***Research for the 21st Century and Beyond***



David Shaw is the Vice President for Research and Economic Development at Mississippi State University. He serves as the Chief Research Officer for the university, and provides oversight for all aspects of the university's research enterprise. He is also the President of the MSU Research and Technology Corporation, and oversees the Thad Cochran Research, Technology, and Economic Development Park. Dr. Shaw plays a leadership role for university-wide strategic research initiatives with industry and state, federal and international agencies. Recent examples include the FAA Center of Excellence for Unmanned Aircraft, the US Army Corps of Engineers high performance computing modernization program, the Department of Homeland Security UAS Test Site, and the United Nations Food and Agriculture Organization (FAO) Global Aquatic Health Center. Dr. Shaw is a Fellow in the American Association for the Advancement of Science, as well as the Weed Science Society of America. He is currently on the executive board for the Council on Research in the Association of Public and Land-Grant Universities. He is also chair of the Southeastern Universities Research Association's Coastal and Environmental Research Committee. Dr. Shaw serves as treasurer for the EPSCoR Coalition board. He has been honored with MSU's highest distinction as a Giles Distinguished Professor, has published more than 180 journal articles, and served as the major advisor for 66 graduate students.

Keynote Speaker #2:

Dr. Ryan Kurtz,

Director of Agricultural & Environmental Research at Cotton Incorporated

Title: ***The Science and Skills that Will Power Farming's Future***

Dr. Ryan Kurtz is a Director of Agricultural & Environmental Research at Cotton Incorporated. In this role, Ryan develops and administers an entomology research program aimed at improving production efficiency and profitability as well as reducing cotton's environmental impact. Prior to joining Cotton Incorporated, Ryan worked for Syngenta as the Lead for Traits Insect Resistance Management (IRM). In this role, Ryan provided IRM expertise primarily in support of research and development projects, product registrations, new active ingredient discovery, as well as stewardship for Syngenta's transgenic insecticidal traits. He holds a B.S. in Agricultural Pest Management from Mississippi State University and a Ph.D. in Entomology from North Carolina State University.

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Keynote Speaker #3:

Dr. Babu P. Patllola,

Dean and Professor of Biology Alcorn State University

Title*: Indispensable strategies to be a standout student: Going back to basics*

Dr. Babu Patlolla currently holds the position of Dean of School of Arts and sciences at Alcorn State University (ASU) since 2013. Prior to that he was Associate Dean for the school for four years. Dr. Patlolla has been a faculty memmber in the Department of Biological Sciences at Alcorn State University for the past twenty years. He is currently serving as Professor of Biology. In his tenure at Alcorn State University, Dr. Patlolla has secured external funding and conducted four week summer workshops for K-12 Math and Science teachers from surrounding school districts for eight years.

Dr. Patlolla is/was a member of several committees at ASU including Academic Priorities committee of Presidential Transition Team, Faculty focus group for Strategic Planning, member of faculty senate, NCATE Standards Committee, Chairman for the Institutional Review Board (IRB) committee. He was ASU Research Council past chair. Since 2011 he is serving on the Mississippi University Research Authority (MURA) Board and he was part of Mississippi K-12 Science Framework Revision Team. Dr. Patlolla is a life member of Mississippi Academy of Sciences. He has published and reviwed articles for peer reviewed journals, he also reviewed Human Anatomy and Physiology, Biostatistics and Zoology text books.

Dr. Patlolla has a Bachelor of Science in Biology & Chemistry and Master of Science in Genetics from Osmania University, India. He has a Master of Science in Biology and Ph.D. in Environmental Sciences from Jackson State University. Dr. Patlolla is a resident of Ridgeland, MS. He is married to Dr. Anita Patlolla and they have a son (Shiva) and a daughter (Sapna).

Keynote Speaker #4:

Ham Benghuzzi, MS, PhD, FBSE, FAIMBE
Professor at the University of Mississippi Med. Center
Executive Director of Mississippi Academy of Sciences

Title: *MAS: 82 Years of Science and Engineering Legacy*

Dr. Benghuzzi is a Professor at the University of MS Medical Center. He is known nationally and internationally as a pioneer in Ceramic Drug Delivery Systems. He has over 250 PubMed indexed articles and over 700 abstracts detailing the release characteristics of various biologicals from novel carriers. He has trained more than 40 PhD students who are actively involved in academic, healthcare, and industry careers. He has mentored students/faculty at all levels (from high school, undergrad, grad, post doc and faculty). He has served as a mentor for residents and faculty on more than 10 funded grants. He has been in research leadership roles in many organizations such as President of the Academy of Surgical Research, Vice President of the Rocky Mountain Bioengineering Society, President of MAS, Academy's Executive Director, President of the International Society for Ceramics in Medicine and also organized and chaired several regional, national and international society programs. He has also served on numerous NIH special emphasis panels including R-25, K01, KO8, T-35, and the P-60 center grants. In addition, he has received numerous awards from various organizations during his career. A few of his awards included: (1) The Presidential Award from the RMBS, (2) Presidential Award from SEM International, (3) the Endocrine's Society Outstanding Investigator Award, (4) MAS Contribution to Science Award, (5) The MAS Dudley Peeler Award, and (6) HEADWAE Award, (7) C. Hall Award, Outstanding Contribution to Biomedical Engineering (32nd SBEC), and (8) ISCM Excellence Award from the International Society for Ceramics in Medicine. He was invited as a keynote/plenary to speak at state, national and international levels including recent invitations in France, Italy, Spain, Greece, China, Poland, Dubai, Japan and Canada. He is a fellow of the American Institute for Medical and Biological Engineering (AIMBE) as well as an International Fellow of Biomaterials Science and Engineering (FBSE).

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Deadlines:

Registration*	Fee	Deadline
Mentors	$50	**7/1/2018**
Student Presenters	**$40**	**7/1/2018**
Attendees and Non-Presenter	**$65**	**7/24/2018**
On-site Registration	**$75**	**7/26/2018**

****Registration fee included: Lunch, Coffee, Tea, Beverages, Snacks, program booklet and info, and access to all events.***

****Presenters must register upon acceptance of abstracts***

Marvelous Door Prizes will be provided during coffee breaks

Event detail will be announced soon through MAS *website (http://msacad.org/)*

Local Arrangement Committee:

Dr. Te-Ming Paul Tseng
Dr. Krish Krishnan
Dr. Amelia Fox
Jay Munyon
Evita Lopez-Gourley
Shandrea Stallworth
Brooklyn Schumaker
Ziming Yue
Rouzbeh Zangoueinejad
Edicarlos Castro
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Dr. Tamara Nelson

Driving Direction: From Highway 12 (traveling East) – Stay on Highway 12 until the light at Spring Street (Hampton Inn is on the right). After the light, the highway divides. Stay right to the Columbus 82 lanes. **Do not go left to the MSU lanes.** Turn right at the next light (Russell Street.) Turn left at the first road. The Bost Extension Center is the four-story building in front of you

From Highway 25 South – Follow Highway 25 to Highway 12 intersection and turn right on Highway 12. Go four lights to Spring Street and follow directions from Highway 12 above.

From Highway 25 Bypass – Take the Starkville exit and after coming to the end of a curved off ramp, at the traffic light turn left onto Highway 12 (under a bridge, Wal-mart is on the left) and go straight. You are now on Highway 12. Go several miles and follow Highway 12 direction about.

From Highway 82 West - Take the third exit, which is the Highway 12 West/Mississippi State University Exit. Stay on this road to the first light (Russell Street), and turn left. Turn left again at the first road. The Bost Extension Center is the four-story building in front of you.

From Highway 82 East – After taking the Starkville exit, merge onto Hwy 182. Turn left

at the first intersection past the Highway Patrol Station (left of the highway) at MSU Entrance. Go straight at the 4-way stop. Will come to a second 4-way stop; turn right onto Barr Avenue. The football stadium on left; go straight at the 4-way stop. Turn left on the first road to the left. Bost Extension Center is the four-story building in front of you.

From Tupelo or West Point, on Highway 45 Alt. South - merge right onto Highway 182 towards Starkville (will see sign). Take next Starkville exit (curved off ramp turning right) and merge right onto Highway 182. Turn left at first intersection past the Highway Patrol Station (left on Highway) at the MSU Entrance. Go straight at the 4-way stop. Turn right onto Barr Avenue at the second 4-way stop. The football stadium is on the left; go straight at the 4-way stop. Turn left on the first road to the left. Bost Extension Center is the four-story building in front of you

Program

8:00-11:00 A.M.: Registration and Poster Set Up

Time	Event
9:00-9:15 AM	**Opening of the event by Dr. Sukumar Saha**
9:15-9:20 AM	**Dr. Ken Butler, MAS President**
9:20-9:45 AM	**Keynote #1 and Host Institution Welcome Remarks: Dr. David Shaw, Vice President for Research and Economic Development, MSU. Title: *Research for the 21st Century and Beyond***
9:45-10:10 AM	**Keynote #2: Dr. Ryan Kurtz, Director of Agricultural & Environmental Research at Cotton Incorporated Title: *The Science and Skills that Will Power Farming's Future***
10:35-11:00 AM	**Coffee Break**
11:00-10:25 AM	**Keynote #3: Dr. Babu P. Patllola, Dean and Professor of Biology Alcorn State University Title: *Indispensable strategies to be a standout student: Going back to basics***
11:25-11:50 AM	**Keynote #4: Dr. Ham Benghuzzi, Executive Director of Mississippi Academy of Sciences Title: *MAS: 82 Years of Science and Engineering Legacy***
11:50-11:59 AM	**Dr. Michelle Tucci, Chair of Student Awards Committee and JMAS Chief Editor, University of Mississippi Medical Center**
12:00-1:15 PM	**Lunch Provided**
1:15-3:00 PM	**Student Poster Presentations and Judging**
3:00-3:15 PM	**Coffee Break**
3:15-4:00 PM	**Awards Ceremony and Student Competition Winners Announcements**
4:00-4:10 PM	**Dr. Sukumar Saha, Event Coordinator; Closing Remarks**

Abstracts

Category: Health Sciences

0439

THE INFLUENCE OF GENETIC VARIATION ON DIETARY VITAMIN E INTAKE AND BODY FAT

Ahmed Saddam[1], Diane Tidwell[2], Terezie Mosby[3]
[1]*Mississippi State University, Starkville, MS, USA,* [2]*Mississippi State University, Starkville, MS, USA,* [3]*Mississippi State University, Starkville, MS, USA*

Vitamin E is a group of fat-soluble micronutrients consisting of tocopherols and tocotrienols. Daily recommended intake for adults is 15 mg. We investigated the association between dietary α-tocopherol, body fatness and single nucleotide polymorphisms rs713598 of TAS2R38 gene. Ninety-two presumably healthy college students (age 18-25 years) were genotyped. Diet history questionnaire (Web-DHQ II) was used to estimate dietary α-tocopherol intake. Bioelectrical impedance was used to measure body fat percentage (BF%), and body mass index (BMI) was calculated. Daily intake of α-tocopherol was highest in CC homozygotes in males and females (20.3 ± 13.5 mg/d and 9.6 ± 5.8, respectively), and lower in G allele carriers; CG 9.8 ± 5.1 and GG 8.6 ± 2.8 in males and CG 9.5 ± 7.6 and GG 8.0 ± 2.9 in females. There was a significant difference (males) in BF% ($p = 0.023$) between CC, CG, and GG genotypes (31.4 ± 5.0 BF%, 22.4 ± 7.9, and 18.5 ± 6.0, respectively) in males, and 28.0 ± 8.7, 28.5 ± 8.8, and 25.3 ± 8.0, respectively, in females. No significant associations were observed between genotypes and BMI. C allele may predispose individuals for higher BF% and higher dietary intake of α-tocopherol while G allele may predispose for lower BF% and lower dietary intake of α-tocopherol. This is the first study investigating the association between dietary α-tocopherol intake, body fatness and genotype and may contribute to the development of a personalized recommendation for vitamin E intake.

0486

"BELIEFS & KNOWLEDGE OF CAM AMONG AREA NURSES, USING MISSISSIPPI AS A MODEL"

Lashanda Brumfield, Ham Benghuzzi, Elgenaid Hamadain
University of Mississippi Medical Centre, Jackson, MS, USA

The growing consumer demand for complementary and alternative therapies (CAM) in health care has had an effect on all health professionals. The discipline of nursing is rooted in many holistic processes but the role of providing such services has not been fully defined in many states, including the state of Mississippi. Nurses are the members of the healthcare team who often initiate such a conversation with patients about CAM. We took a look at the state of Mississippi nurses and their perception of such a going consumer demand with effective healthcare services in mind. This was a descriptive quantitative study, with a sample size of 116 Mississippi Nurses. The sample included participants in attendance to the 2016 MS Nurses Association Annual Meetings & Conventions. Overall 80% of nurses felt that their higher education institution did not provide adequate education on Complementary & Alternative Medicine. Fifty-three percent reported actually taking some course that covered a component of CAM, leaving 95.6% feeling that the physician should be the one to talk to patients about CAM use. Our findings highlight the fact that Mississippi nurses feel unprepared in CAM education when talking to their patients. Our findings also highlight the associations between Mississippi nurses feeling comfortable talking to their patients about CAM and nurses attending a higher education institution within the state of Mississippi, with a P=.857.

0490

COMPARISON OF THE EFFECT OF TROGLITAZONE, METFORMIN, AND INTENSIVE LIFESTYLE MODIFICATIONS TREATMENTS ON C- REACTIVE PROTEIN IN INDIVIDUALS WITH PREDIABETES

Khalid Mokhtar, Elgenaid Hamadain, Hamed Benghuzzi, Michelle Tucci
University of Mississippi Medical Centre, Jackson, MS, USA

Inflammation is an important factor in the development and progression of multiple cardiovascular diseases especially atherosclerosis and coronary heart diseases. The C-reactive protein (CRP) levels is very important in the

prediction of future cardiovascular events, however, it has not been well emphasized in several studies. Limited studies investigated the effect of troglitazone on inflammatory markers including CRP levels in individuals with diabetes mellitus, and very few analyzed this effect on individuals with prediabetes. The Diabetes Prevention Program (DPP) is a large randomized trial which evaluated the effect of different interventions including metformin and intensive lifestyle modifications compared to placebo on the prevention of DM. This analysis evaluated the effect of troglitazone on CRP levels in a subgroup of the DPP population included a total of 3,171 subjects from the original DPP study. The effect of the interventions was also reported by sex. The effect of troglitazone on inflammatory markers was measured by analyzing its effects on CRP levels at baseline and at 12 months and compared it to the other three interventions (Intensive Lifestyle, metformin, and placebo). The median percentage change in CRP at 1 year from baseline was -20.00 percent in the troglitazone arm ($p < 0.001$ for all between group analysis: troglitazone vs. lifestyle, troglitazone vs. metformin, & troglitazone vs. placebo). In conclusion, this analysis showed that troglitazone produced significantly greater reduction on CRP levels compared to metformin. Additionally, troglitazone caused 27.8 % reduction in median levels of female CRP compared to only 14.6 % reduction in male CRP levels.

0499

IMPACT OF OCCUPATIONAL FOOTWEAR AND WORKLOAD ON POSTURAL STABILITY IN WORK SAFETY

[1]**Sachini N K Kodithuwakku Arachchige** , [1]Harish Chander, [1]Alana J. Turner, [1]Phillip E. Sutton, [1]Adam C. Knight, [2]Daniel W. Carruth

Mississippi State University, STARKVILLE, MISSISSIPPI, USA

Background: The impact of occupational footwear and workloads on postural stability has been studied previously to prevent fall-related workplace injuries. **Objective:** The purpose of the study was to assess the impact of two occupational footwear; steel-toed (SB) and tactical (TB) work boots on balance when exposed to a physical workload. **Methods:** Eighteen male participants were tested for postural stability in eyes open (EO), eyes closed (EC), eyes open unstable surface (EOU) and eyes closed unstable surface (ECU), prior to (PRE) and two times after a workload (POST1 & POST2) separated by 10 minutes of rest. Postural sway parameters were analyzed using a 2 × 3 repeated measures analysis of variance. **Results:** Findings revealed that the use of SB resulted in greater postural stability, which could be attributed to the design characteristics of this footwear and that postural stability was negatively impacted immediately after the workload which could be attributed to the physical exertions during the workload. However, significant differences were limited to ECU with no visual and altered somatosensory feedback. **Conclusion:** Design features on occupational footwear can aid postural stability while physical exertional tasks can be detrimental. Findings can offer design and work-rest scheduling suggestions to improve workplace safety.

0503

PREVALENCE OF GASTROINTESTINAL PARASITES IN NORTHERN MISSISSIPPI SHELTER CATS

Christina Loftin[1], Uri Donnett[1], Liesel Schneider[2], Andrea Varela-Stokes[1]

[1]Mississippi State University, Mississippi State, Mississippi, USA, [2]University of Tennessee, Knoxville, Tennessee, USA

Parasitism of domestic cats (*Felis catus*) impacts feline health and has public health implications when zoonotic parasites are present. High parasite burden can cause anemia, immune-suppression, and poor vaccine response. Our objective was to evaluate the prevalence and intensity of gastrointestinal parasites in cats from northern Mississippi animal shelters. Feline cadavers (n=56) were collected from August 2017 to January 2018 from seven animal shelters in Northern Mississippi. Data collected included shelter source, gender, reproductive status, intake date and source, and internal/external parasite prevention records. Cadavers were processed to isolate stomach, small intestine, and large intestine. Sieves were used to collect contents which were then examined using stereomicroscopes for helminth identification. Centrifugal flotation with Sheather's sugar solution were performed on feces recovered from the rectum. Urine sediments were examined following centrifugation. We recovered helminths in 45 of 56 cats (80%). Thus far, we have identified *Ancylostoma* spp. (52%), *Toxocara cati* (41%), *Taenia taeniaeformis* (29%), *Dipylidium caninum* (21%), and *Spirometra* spp. (2%). Thirty-six of 56 cats had positive fecal examinations (64%), with parasite eggs including *Toxocara cati* (39%), *Ancylostoma* spp. (34%), *Coccidia* spp. (23%), *Spirometra* spp. (9%), *Taenia taeniaeformis* (9%), and *Capillaria aerophilia* (5%). Additionally 3 of 48 cats (6%) had capillarid-type eggs (*Pearsonema* spp.) in urine sediment. *Ancylostoma* spp., *D. caninum*, *T. taeniaeformis*., *T. cati*, and *Spirometra* spp. are associated with human infection and were identified in this study. This is significant for feline and human health as, without proper healthcare, these cats may be released still shedding zoonotic parasites.

0520

CHARACTERIZATION OF SURFACE PROPERTIES AND COMPRESSIVE MODULUS OF 3D PRINTED POLYLACTIC ACID SCAFFOLDS

Weitong Chen, Julie Wyse, Frank Brinkley, Matthew Priddy, Lauren Priddy
Mississippi State University, Starkville, Mississippi, USA

Autograft is currently the gold standard for treating bone defects. However, due to the limited volume of harvested bone, the development of customized bone scaffolds with suitable mechanical and biological properties is an urgent need. The objective of this work was to investigate the effects of pore size and surface modification of 3D printed polylactic acid (PLA) scaffolds. First, to examine the effect of nano-hydroxyapatite (nHA) coating on PLA surface properties, ten solid PLA discs (5×5×2mm) were 3D printed; five remained non-coated and five were nHA coated via alkali treatment. The morphology and surface chemistry were observed by scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDX), respectively. The influence of nHA coating on hydrophilicity was evaluated by water contact angle (WCA). Second, to evaluate the effect of pore size on mechanical properties, non-coated PLA scaffolds (4×4×8mm) with both 560μm and 700μm cubic pores were 3D printed, and compression tests were performed. Young's modulus was calculated by normalization of load to one layer of struts. On coated samples, nHA crystals were observed via SEM and a calcium peak was detected via EDX. Hydrophilicity was significantly enhanced for coated samples (69.47 ± 5.99°) as compared to non-coated samples (51.90 ± 5.46°) ($p<0.01$). From compression testing of porous scaffolds, there was no difference in Young's modulus. In conclusion, the nHA coating had a positive effect on PLA hydrophilicity. The scaffolds have the potential to mechanically mimic native cancellous bone. Experiments to further investigate mechanical properties and cell attachment are ongoing.

0524

COMPARISON OF INTERDISCIPLINARY VIEWPOINTS REGARDING COLLABORATION AMONG PROFESSIONALS IN THE PERIOPERATIVE SETTING USING MODIFIED Q-METHODOLOGY

Julia Sherriff, Elgenaid Hamadain, Ralph Didlake, William Mustain, Donna Sullivan, Michelle Tucci, Hamed Benghuzzi
University of Mississippi Medical Centre, Jackson, USA

Background: Continued concerns for improvements in safety and quality in the perioperative setting (PS) call for interdisciplinary collaboration (IC) to match and supplant the change brought by innovation.

Purpose: This study aimed to describe patterns of ICPS factor prioritization within the interdisciplinary team (IDT). Research Questions:

1. What antecedents of IC are considered by IDT professionals to be important in PS?

2. What viewpoints and potential contentions exist in prioritizations of IC improvements?

Methods: Mixed-methods survey was conducted upon UMMC IRB exempt approval using Research Electronic Data Capture (REDCap) platform. ICPS factor Q-sort was obtained from the concourse of statements about potentially significant ICPS antecedents. The viewpoint groups were then identified using Q-factor analysis in SPSS.

Results: Primary factors of ICPS: Critical Communication and Feedback (CCF), Purpose, Team Technical Competence (TTC), Trust, and Adaptability. Cumulative 94.672% of variance was explained with eight viewpoint groups with Eigenvalues greater than 1.0 and factor loadings greater than 0.30 in the QFA model (N=28): Technocratic, Polarized-reflexive-visionary, Collegial, Communicator, Focused on Critical Process, Power-Observant (conscious of power dynamics), and Task-Oriented.

Conclusions: Identification of potential sources of contention and dispute are necessary for IDT collaborative reflexivity and adaptability in innovative environment of PS. We were able to identify the primary factors important in improving ICPS and the viewpoint patterns using modified Q-methodologic approach.

Acknowledgments

This research was performed in partial fulfilment of PHD dissertation requirements in Clinical Health Sciences at UMMC. Manuscript was recently published in the International Journal of Current Research, 9 (11), 2017.

0534

THE ROLE OF VITAMIN D CONSUMPTION AND HEALTH DISPARITIES BETWEEN GENDERS: NHANES 2007-2014

Shamonica King, Hamed Benghuzzi, Elgenaid Hamadain, Michelle Tucci
University of Mississippi Medical Centre, Jackson, MS, USA

According to research, vitamin D is a long-studied contributor of health and wellness, which includes disease prevention, and treatment. While research studies have shown a variance in some diseases and mortality rates between sex groups, it is left undiscovered if there are any undetected links. From a nutritional perspective, vitamin D could be a plausible attributor. In this study, the amount

of vitamin D consumed between male and females were analyzed. Using this data, it could be revealed that several disease states affected by vitamin D status, may also have an effect on sex groups. Data was obtained from the National Health and Nutrition Examination Survey (NHANES) responses. This data includes vitamin D that was consumed through food nutrients and through supplements which contained vitamin D. This report includes gender information, which includes all age, race and other demographic groups. The results of this study revealed that the male sex consumed more vitamin D through food nutrients (17.1% in cycle year 1; 16.2% in cycle year 2, 18% in cycle year 3; and 20.3% in cycle year 4. On the other hand, the female sex consumed more vitamin D via supplement consumption during the 2007-2014 cycle years. In cycle year 1, the female group consumed 15.7% more than males, 0.01% in cycle year 2, 27.5% in cycle year 3 and 27.1% in cycle year 4. This study also reveals a positive trend of vitamin D consumption through food nutrients and supplements, throughout all cycle years, and for both sexes.

0552

DEVELOPMENT OF AN INFLUENZA A BIOSENSOR WITH SIALIC ACID-BOUND GOLD NANOPARTICLES

Hamilton Wan
The Mississippi School for Math and Science, Columbus, MS, USA

The influenza A virus causes acute respiratory disease in humans. Each year, seasonal influenza affects 3-5 million people, with approximately 500,000 deaths worldwide. Thus, the rapid diagnosis of influenza is vital to early anti-influenza treatment and containment. Unfortunately, current methods of influenza diagnosis are either costly or time-consuming. The aim of this study is to develop a colorimetric biosensor using sialic-acid bound gold nanoparticles for the rapid detection of the influenza virus. It was hypothesized that gold nanoparticles would aggregate around influenza viruses and reduce nanoparticle-to-nanoparticle distance, leading to observable color changes. Three methods for synthesizing sialic acid-bound gold nanoparticles were developed and compared. The first method used N-acetylneuraminic acid to reduce chloroauric acid and synthesize gold nanoparticles whereas the second method linked alpha(2,6)-linked sialylglycans to gold nanoparticles using a streptavidin-biotin bond. Thirdly, alpha(2,6)-linked sialylglycans were used to reduce chloroauric acid and synthesize gold nanoparticles. All three nanoparticle solutions were able to colorimetrically detect influenza viruses in solution. Nanoparticles synthesized using the first method were shown to detect influenza viruses at approximately 10,000 TCID50/mL and were highly cost effective, at about 3 cents per test. The efficacy of the second and third methods suggest that these nanoparticles can be used for the specific detection of only human influenza strains. All three nananoparticle platforms were also effective at a volume of as little as 10 microliters. Thus, sialic acid-bound gold nanoparticles can be used as a quick, inexpensive, and sensitive biosensor for the detection of influenza viruses.

0553

PREVALENCE OF DIABETES AMONG ADULTS IN THE UNITED STATES, 2007-2014

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Objectives:To evaluate the prevalence of diabetes among U.S adults by age, sex and race or ethnicity using data from the National Health and Nutrition Examination Survey (NHANES) from 2007-2014.Methods:A cross-sectional analysis of the NHANES, 2007-2014 was performed, which is a multistage cluster sample design survey and represent non-institutionalized U.S population. The data contains 4 distinct survey cycles (2007-2008, 2009-2010, 2011-2012 and 2013-2014). The percent prevalence of self-reported diabetes in each cycle were analyzed using hemoglobin A1c(HbA1c) and fasting plasma glucose(FPG) reported by NHANES. The Estimates of diabetes prevalence among adults was calculated with univariate t-test. The prevalence of diabetes was defined by self-reported diagnosis of diabetes using HbA1c≥6.5% or a FPG≥126 mg/dL. All statistical analysis was performed using SAS 9.4. Results:The overall age-adjusted prevalence in 2013-2014 was 11.2%. Among men, no change was observed between 2007-2008 (12.3%) and 2013-2014 (12.4%). Among women, there was no change observed in diabetes between 2007-2008 (10.3%) and 2013-2014 (10.3%). In 2013-2014, there were significant differences in obesity by race/ethnicity and age. Approximately 9.6% of non-Hispanic white adults had diabetes as were 16.3% of non-Hispanic black adults, 15.6% of Hispanic and 15.5% non-Hispanic Asian. Among adults aged 25 to 44 years, 4.8% were diabetic while 16.4% of adults aged 45 to 64 years, and 25.0% of those aged ≥65 were diabetic in 2013-2014 ($p<0.05$). Conclusion:The prevalence of diabetes has been increasing, especially among non-Hispanic blacks and the Hispanics. Future research should focus on reducing and preventing diabetes among these groups.

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Category: Physics and Engineering

0435

HIGH ACCURACY COMPUTATIONAL DYNAMICS INTERFACE CAPTURING ALGORITHM AND SOLVER DEVELOPMENT

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Development of interface capturing methods has been an important research topic in the field of computational fluid dynamics (CFD), of relevance to accurate prediction and modeling of multiphase flows. Multiphase flows appear in a wide spectrum of engineering applications, such as fuel injectors, chemical reactors, petroleum reservoirs, ocean and geothermal systems. To enable more accurate and cost-efficient prediction of multiphase flows, new interface-capturing method built on the state-of-the-art numerical scheme is required.
This work presents a novel interface-capturing method based on the discontinuous Galerkin method. To make good use of the available computational resources, MPI-based parallel computing capability is developed. The MPI approach divides the computational domain and assigns them to different processors. Data exchange between processors is required for accurate results, therefore, overlapped halo regions are allocated within each processor to store exchanged data. After the solver is parallelized, we couple our own algorithm with the solver and run fundamental interface cases including "disk in a vortical flow" and "Zalesak disk in a circular flow". To validate the accuracy of the solver, we consider benchmarking against the Multidimensional Universal Limiter with Explicit Solution (MULES) method and isoAdvector method, both of which represents the state-of-the-art interface-capturing methods and are enabled in the OpenFOAM software platform. The study found that the new interface-capturing method provides more accurate results compared to the peers with comparable computational cost.

0438

A FRAMEWORK OF MODELING AND ASSESSING SYSTEM RESILIENCE USING A BAYESIAN NETWORK: A CASE STUDY OF ELECTRICAL INFRASTRUCTURE SYSTEM

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After recent catastrophic disruptions in its electrical system, a prime concern of the United States is the development of a resilient electrical system. This research utilizes Bayesian network to addresses a range of possible risks to the electrical power system and its interdependent networks and offers possible options to mitigate the consequences of a disruption. The interdependent electrical infrastructure system in Washington, D.C. is used as a case study to quantify the resilience using the Bayesian network. Quantification of resilience is further analyzed based on different types of analysis such as forward propagation, backward propagation, and sensitivity analysis. The general insight drawn from these analyzes indicate that reliability, backup power source, and resource restoration are the prime factors contributed towards enhancing the resilience of an interdependent electrical infrastructure system.

0443

CLASSIFICATION OF SENIOR SYSTEMS ENGINEERING MANAGERS BASED ON THEIR SYSTEMIC THINKING'S LEVEL AND DIFFERENT ORGANIZATIONAL OWNERSHIP STRUCTURE

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The dynamic nature of a business environment makes it difficult for engineering managers to implement viable strategic planning to improve organizational effectiveness. The complexity resulting from an intricate organizational structure often compels stakeholders to address complications to allocate the strategic resources properly and amplify the organizational value creation capacity. In response, Systems Thinking (ST) helps engineering managers understand the interdependencies among the various sub-elements of the organizational structure to deal with challenges of a dynamic nature in the complex business environment. In this research, we assess and classify the system thinking aptitude of Senior Systems Engineering Managers (SSEMs) witrh 21+ years of managerial exprience who working in a complex environment in regard to two criteria: (1) the organizational ownership structure—public versus private sector-- they are working at, and (2) their Overall Systemic Thinking (OST). An independent-samples t-test and Binary Logistic Regression (BLR) conducted, respectively to compare and classify two different organizational structure. Then, an advance classification method Bayesian Latent Class Analysis (BLCA) performed to classify SSEMs based on their OST. Then, both classification results were compared to each other to show the main characteristics of SSEMs who work in each category. The findings of the research show that the systems thinking aptitude of SSEMs in public and private sector, respectively can be classified more toward higher and lower Overall Systemic Thinking (OST) classes. In order to check the validity of the results, we

reviewed existing literature and found that our results are consistent with those of other researchers.

0451

DUAL EXCITATION RAMAN SPECTROSCOPIC ANALYSIS ON WATER LEVELS IN BIOLOGICAL TISSUES.

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Raman spectroscopic analysis was done on several human teeth samples as well as dry and wet chicken and pork skin. The goal was to determine the levels of both tightly bound water and unbound water in the enamel portion of the teeth as well as the skin tissue. Dual excitation Raman spectroscopy was pertinent for this study in order to achieve a greater range in wavelength, hence revealing the region where water could be detected in the enamel via -OH bonding. Fluorescence emitted from proteins is a common issue when probing biological tissues, however, the NIR illumination of Raman spectroscopy greatly reduces the auto-fluorescence of biological samples such as chicken and pork skin. Additionally, dual excitation will allow the detection of protein structure changefrom wet to dry skin.The patterns in the results reveal that a higher right shoulder in the C-H region of the skin is associated with a greater -OH intensity, meaning a larger content of unbound water. Furthermore, healthy enamel contains both bound and unbound water while the decayed enamel or lesions mainly has a reduced amount of unbound water. These parameters can successfully be exploited to study differences between healthy and unhealthy tissues and provide a non-invasive way to analyze tooth integrity.

Acknowledgement: This work was supported by an Institutional Development Award (IDeA) from the NIGMS under grant number P20GM103476.

0459

INFLUENCE OF CURE PARAMETERS AND LAMINATE THICKNESS ON THE INTERNAL STRAIN AND FRACTURE TOUGHNESS OF CFRP COMPOSITES

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The objective of this study is to investigate the influence of composite processing parameters on the residual strain during cure and fracture energy using embedded optical fibers. Determination of optimal cure parameters is needed to enhance mechanical properties to meet industry design requirements. Optical fibers were woven into dry non-crimped carbon preforms near the midplane of [0/90/90/0]3s and [0/90/90/0]9s laminate configurations. A one-step cure cycle and two-step cure cycle were used in the fabrication of four composite laminates. Laminates were cured using a vacuum assisted resin transfer molding process. During cure, residual strains with respect to spatial position and time were monitored. Results reveal that significant variation of internal strains occur near the laminate edges. After cure, double cantilever beam tests were performed to determine the mode I fracture energy. Curing parameters are shown to significantly influence the fracture toughness for thick laminate configurations.

0462

STRAIN DISTRIBUTIONS IN BONDED COMPOSITES USING OPTICAL FIBERS

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Adhesive bonding of composite materials can be applied to assemble light-weight structures for aeronautical applications. However, the application of adhesive bonds in primary load-bearing structures is limited by the lack of adequate techniques to monitor the quality of the joint during service. Distributed sensing using optical fibers shows promise for monitoring these bonds due to their small size, light-weight, and ability to obtain continuously distributed strain data. This work evaluates the feasibility of using optical fibers to monitor the distribution of strains developed along the bonded region in double lap shear (DLS) specimens by establishing a procedure to embed optical fibers within composite bonded structures and testing them under tension. Three different positions for the optical fibers were experimentally studied namely in the seventh ply, at the composite/adhesive interface, and in the adhesive. The manufacturing techniques for embedding the fibers are presented. The optical sensor placed in the adhesive recorded sharp spikes in strain readings at the ingress and egress points where the fiber enters and exits the bond line, along with a center spike corresponding to the butt joint in the double lap shear specimen. The optical sensors placed at the seventh ply and the composite/adhesive interface captured the greatest strain gradients.

0463

INVESTIGATING THE EFFECT OF VARYING THICKNESS OF ADHESIVE LAYER USING OPTICAL FIBER-BASED SENSING

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The use of composite materials has increased in the aerospace industry. However, unlike traditional structural metals, composites cannot be fastened mechanically without developing high stress concentrations near the fastened areas. Often composite materials are bonded adhesively to homogeneously distribute the stress in the

bonded joint. It is important to understand the behavior of adhesive bonds to better predict the overall strength of the composite structure. One of the properties of a bond is its thickness. The effect of the varying bond thickness on the strength of the composite bonded joint will be presented. To explore the effects of different bond thicknesses, fiber optic strain sensors embedded in the bond layer were used to obtain strain data. Tensile tests were performed and strain data will be collected for different specimens with different bond thicknesses. In addition to strain data, ARAMIS digital image correlation system was used to evaluate the surface strains of the bonded region. The results show that thicker bonds failed at a higher load when compared to a thin bond. The DIC results show a banding pattern where a compressive and tensile strain field is observed.

0465

INVESTIGATION OF COMPOSITE BONDED STRUCTURES USING OPTICAL FIBERS IN DYNAMIC TESTING

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Composite adhesive bonding is found in numerous applications in a variety of industries such as aeronautics, aerospace, automotive, construction, and sport. Since aerospace vehicles are subjected to vibration loading, this work studies the behavior of composite adhesive bonds under dynamic loading. Carbon composite bonded structures will be subjected to frequency sweeps of 2-150 Hz. Strain distributions from within these composite structures will be obtained from optical fibers embedded within the adhesive layers. Optical fibers will be used due their attributes of small size, lightweight, ability to obtain a continuous distribution of strain, and their resistance to electromagnetic interference. Results from this study will be used to develop a predictive computational model. The primary objective of this research is to investigate adhesive bond integrity for damaged and undamaged structures using optical fibers in dynamic testing. This research will obtain the modal characteristics of the structures using data from accelerometers and optical fibers. This research contributes to the development of structural health monitoring system for air vehicles.

0474

LASER-INDUCED BREAKDOWN SPECTROSCOPY FOR QUANTITATIVE ANALYSIS OF TRACE ELEMENTS IN HIGH PRESSURE CO2 ENRICHED WATER: AN APPLICATION TO CARBON SEQUESTRATION

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Reduction of carbon dioxide remains the prime option to substantially circumvent deterioration of the ecosphere. A promising approach is Carbon Capture and Storage (CCS), which consists of trapping carbon dioxide at the source plant, compressing to supercritical fluid and storing in a well-selected site. Storage of CO2, however, requires a careful selection of sinks that can securely store CO2 for a considerable geological time without causing another major ecological concern. Although carbon capture and storage has proven to be the best way of mitigating anthropogenic release of CO2, it requires constant monitoring of the integrity of the storage because the risk of CO2 leakage is real and can potentially impact groundwater resources. Also a sudden outburst of dissolved CO2 can be released, killing thousands of people and animals with serious impact on the ecosystem as well. Therefore, a careful selection and characterization of the potential storage sites is necessary and as is constant monitoring of its integrity as well. Potential leakage can be predicted by monitoring the physical and chemical changes of the geological fluids. To this effect, we present the use of laser-induced breakdown spectroscopy to monitor the variation of trace elements in the presence of dissolved CO2 at high pressure. This can predict changes in the chemical composition of a reservoir and by extension, the degradation of the storage site.

0487

RAMAN SPECTROSCOPY OF STARCHSTABILIZED GOLD NANOSTRUCTURE PLATFORM FOR SKBR3 SENSING

Anant Singh, **Aysha Evans**
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A method for gold nanoparticle (AuNP) synthesis from buffered starch solution has been developed and the particles were investigated by UV/Vis spectroscopy, transmission electron microscopy (TEM) and atomic force microscopy (AFM). For the synthesis of AuNPs, we used rice (*Sella*) starch as the unique reducing and stabilizing agent, chloroauric acid ($HAuCl_4 \cdot 3H_2O$, A) as the metal precursor, and deionized (DI) water ($\rho > 18.2$ MΩ cm) as dispersing medium. Among several inorganic and biological Good's buffers, phosphate and MES buffers give the best results with quite uniform AuNPs. Typical AuNP diameters from MES and phosphate buffers (PB) are 4 ± 1 nm and 13 ± 2 nm with plasmon band peaks at 521 nm and 523 nm, respectively. The role of the phosphate buffer is mainly to control the pH, while MES is also a synergist with more composite function. TEM confirms the crystalline structure of the AuNPs, meaning that the AuNP surfaces are low-index single-crystal facets such as (100), (110) and (111). Surface of obtained AuNP was conjugated with S6 and HER2 antibody for breast cancer cell (SKBR3) binding and screening. Primary result revels the sensitivity of the

system up to ~60 cell/mL, and found to efficiently enhance sensitivity and selectivity only for SKBR3 cell avoiding any other biological cells available in the mixture. "This work was supported by the Mississippi INBRE, funded by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number P20GM103476."

0491

MATERIAL PROPERTIES TESTING OF HEPA FILTER MEDIA: POST ISOTHERMAL ACCELERATED AGING

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The Institute for Clean Energy Technology at Mississippi State University actively engages in the testing and analysis of nuclear grade High Efficiency Particulate Air (HEPA) filters and filter media. This study analyzes non-nuclear grade media before and after isothermal treatment that simulates accelerated aging via thermal degradation to the multiple protective coatings applied to the borosilicate glass fibers. The study utilizes material properties techniques such as tensile strength, water repellency, and thickness to provide quantitative data before and after thermal treatment at 60°C (140°F) and low relative humidity. The goal is to determine viability of the protective coatings after experiencing thermal degradation. This investigation aids in constructing a timeline for the effective use of HEPA filters due to failure of their component materials over a period of time or storage processes. The data from this study has the potential to extend the regulation lifespan of HEPA filters, thereby decreasing money spent on new filters without sacrificing public safety.

0494

AN ATOMISTIC STUDY OF THE DEFORMATION BEHAVIOR OF BULK SINGLE CRYSTALLINE TITANIUM ALLOYS

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The unique and novel properties of titanium alloys, which include low density, high tensile strength and toughness (even at extreme temperatures), excellent corrosion resistance, and bio-compatibility make these alloys widely usable for many industries, such as military, aerospace, automotive, and biomedical applications. For most applications, titanium is alloyed with aluminum and vanadium to create an alpha-beta-phase stabilized titanium that is easier to fabricate. Although this alloy is widely used, there are limited molecular dynamics (MD) studies, with published studies limited to alpha-Ti and Ti-Al nanowires. In the current study, using a newly developed ternary Ti-Al-V potential, we performed MD simulations on bulk single crystalline Ti, Ti-6Al, and Ti-4V to take a closer look at effect of alloying on the tensile properties and deformation mechanisms of these material systems. The models were subjected to uniaxial tensile loading, up to a maximum 0.2 strain. The plastic deformation mechanisms during structure evolution has been found to be dependent on model size, crystal orientation and strain rate. This work presents the first attempt to use MD simulations to understand the effect of alloying elements on the deformation mechanisms during the structure evolution of single crystalline Ti, Ti-6Al, and Ti-4V systems. With our results, we aim to assist the production of next generation nano devices, light-weight products, and high-temperature engineering products.

0505

STRUCTURAL CRACK DETECTION AND ITS LOCATION ESTIMATION USING AN UNMANNED AERIAL VEHICLE

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As buildings age, the crack is a critical factor in building's safety. In the field of structural health monitoring, images are mainly used for finding cracks. However, it is hard to know the location of the cracks using the images only. In this paper, we proposed a system which can detect structural cracks including the location of the cracks. The suggested system is divided into the detection of cracks and the estimation of the cracks' location. In the crack detection part, we developed an efficient method to detect the presence of cracks using a convolutional neural network, which is one of deep learning techniques. In the cracks' location estimation part, a homography of multiple images is estimated by finding feature points on the images using the Speed-Up-Robust-Feature and M-estimator-Sample-Consensus methods, and the actual location of the cracks are estimated using the information. Through experiments, the performance of the method developed for the crack detection and its location estimation is validated. The results can help inspectors find structural cracks easily.

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Category: Agriculture and Plant Science

0434

NANO-CHITOSAN PARTICLES AS ENVIRONMENTAL FRIENDLY WOOD PRESERVATIVES

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This study examines decay and fire retardant properties of wood treated with cross-linked chitosan nanoparticles and a commercial fire retardant, tripolyphosphate. Low molecular weight chitosan was depolymerized, and thin layer chromatography was performed to estimate the size of resultant oligomers by comparison to standards. Then the oligomers were mixed with tripolyphosphate to create chitosan-TPP nanoparticles as wood preservative. After vacuum-based treatment, both leached and unleached wood samples were exposed to brown rot fungi (Gloeophyllum trabeum). Mass loss of the samples was compared to untreated wood controls. Fire resistance of treated wood samples was estimated using cone calorimeter. The oxygen consumption during combustion, time to ignition, and heat release rate of wood samples were determined. Results indicated that unleached treated samples performed well.
Keywords: Nano-chitosan particles, Decay fungi, fire retardancy, southern yellow pine and wood preservative

0440

WHEY PROTEIN ISOLATE STABILIZED O/W NANO-VESICULAR EMULSION SYSTEMS WITH CURCUMIN HYPER-ACTIVATED BY UV RADIATION

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As part of ongoing research to hyper-activate and deliver natural generally recognized as safe (NGA) in aqueous food/nutraceutical systems, stable O/W nanoemulsions were generated by ultra-high pressure homogenization (UHPH) at 140 and 210 MPa for use as nano-vesicular vehicles (NVV) to carry hydrophobic NGAs. Curcumin (CU) (diferuloylmethane) was used for its recognized antioxidative activity and because of its ready participation in Michael reaction with nucleophiles at pH above 8.0. Two important variables, (1) addition of casein hydrolyzate (CH)(1:50, w/w WPI) and, (2) use of UV radiation at 290-310 nm for 0, 15, 30, 60 min, were studied for their effect on stabilization of monodispersed NVV and persistence of antioxidative activity of the CU as cargo in NVV through storage. Size distribution and stability over time was determined using a S3500 Bluewave Multi-Laser Particle Size Wet/Dry Analyzer. Addition of CH resulted in significant reduction in nano-particle size (dvs) with application of pressure where the mean NVV monomodal distribution of was 17% smaller at 210 MPa compared to 140 MPa. Addition of CH also increased the stability with UHPH pressure as reflected by 63% smaller dvs at 210 compared to 140 MPa. The nanoparticle distribution was not significantly change on the addition of CU; mean dvs being 101 and 93 nm at 140 MPa and 73 and 92 at 210 MPa for NVV and CU-NVV, respectively. Ultraviolet radiation for ≥ 30 min enhanced nanoparticulation dramatically and significantly ($P<0.05$) though there is no significant difference between the two UHPH pressures used.

0441

EFFECTS OF CHANGING PARENTAL ENVIRONMENTS (TEMPERATURE AND CO_2) ON BIG BLUESTEM SEED QUALITY AND POST-SEASON SEED GERMINATION TRAITS

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An experiment was conducted to test the hypothesis that growth temperatures and CO2 conditions, will modify seed quality traits and thus affect big bluestem post-season seed germination response to temperature. Big bluestem seeds were obtained from eight parental environments (PE), a combination of four growth temperatures (GT) (35/27, 30/22 (optimum), 25/17, and 20/12 °C) and two CO2 levels (360 and 720 µL L^{-1}). Seed weight, nitrogen, and carbon contents were measured in all treatments at the end of the season. Seeds produced from the PE were germinated at eight constant temperatures (SGT) from 10°C to 45°C. Seed germination was recorded at 6-h intervals in all temperature treatments. Maximum seed germination (MSG), germination rate (GR), and germination-dependent cardinal temperatures varied among eight GT and SGT of big bluestem. When averaged among the CO2 treatments, the high- and low-parental GT-grown plant seed 30 and 27% less maximum seed germination, respectively when compared to the two middle GT. Among parental environments, elevated GT resulted decline in MSG and SGR. Elevated CO2 modified seed germination-dependent cardinal temperatures. Significant and linear correlations recorded between seed quality parameters and seed germination traits ($R^2 > 60$) showed that PE modify seed quality traits resulting post-season germination responses.

0448

SOYBEAN PHYSIOLOGY AND HYPERSPECTRAL REFLECTANCE TO FLOOD STRESS AT REPRODUCTIVE STAGE

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Flood stress is a universal phenomenon that affects crop production. An outdoor pot culture experiment was

conducted to determine flooding effects on soybean growth and physiology during the reproductive period. Soybean, Asgrow AG5332, was seeded in 5.2 L pots filled with 3:1 by volume fine sand and topsoil, respectively, and irrigated with full-strength Hoagland's nutrient solution. After 34 days of sowing, treatments imposed were sustained at 2.5 cm above the soil surface for 16 another days. During the experiment, soil oxygen content was measured continuously. Growth parameters, hyperspectral reflectance properties, leaf gas exchange, and midday leaf water potential were measured at the end of flood period. Soil oxygen concentration rapidly declined and reached zero levels within four days of flood treatment, while the control remained at 18%. Midday leaf water potential showed 77% lower than the control in the flooded plants. Leaf gas exchange rates, photosynthesis, stomatal conductance, and transpiration also declined by 41-65% in plants under flooded conditions compared to the control. Flooded plants showed higher reflectance values in photosynthetically active, blue, green, and red regions and lower reflectance values in near-infrared, tissue water content regions reflecting the changes in chemistry and pigment contents compared to the control plants. All plant growth parameters and reproductive potential declined in the flooded treatment compared to control. This study suggests that soybean plants are very sensitive to flooding conditions during the reproductive period and remote sensing properties could be used to estimate flooding damage under field conditions.

0449

INFLUENCE OF CATFISH EXTRACTS ON ATTACHMENT AND BIOFILM FORMATION BY LISTERIA MONOCYTOGENES ON FOOD-CONTACCT SURFACES

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The objective of this study were to determine the biofilm formation by Listeria monocytogenes on various food-contact surfaces at different temperature using extracts from catfish processing environment. Five extracts were tested: (1) catfish skin with mucus; (2) catfish skin without mucus; (3) catfish mucus only; (4) catfish whole muscle extract; and (5) catfish chiller-tank water. L. monocytogenes Bug600 was able to form biofilms on all extracts on stainless steel surface at 4°, 16°, 22° and 37°C in 7 days. The biofilm formation by L. monocytogenes Bug600 was greater at higher temperature as compared to lower temperature. L. monocytogenes Bug600 biofilm counts on polyethylene and polyurethane surfaces were 1 log CFU/cm2 greater on the skin with mucus as compared so skin without mucus at 22°C after 7 days. Biofilm formation was 1-1.5 log CFU/cm2 lower on buna-N rubber as compared to stainless steel, polyethylene and polyurethane surfaces in the presence of catfish mucus extract. These findings show that L. monocytogenes can grow and subsequently form biofilms on different food-contact surfaces in presence of catfish residues found in the processing plant. This study will be useful for designing proper sanitation procedures in catfish processing plants to inactivate L. monocytogenes biofilms.

RESPONSE OF 100 ELITE RICE LINES TO IDENTIFY DROUGHT TOLERANCE USING DEVELOPING A SCREENING TOOL IN THE US MIDSOUTH

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Drought stress is a major abiotic stress factor that affects growth and development of plants at all stages. An experiment was conducted to evaluate 100 rice experimental breeding lines for tolerance to drought stress under pot-culture in a mini-greenhouse condition. The rice seedlings were subjected to two different soil moisture regimes, 100 and 50% field capacity, from 10 to 30 days after sowing (DAS). Several morpho-physiological parameters including root traits were measured at the end of the experiment, 25-30 DAS. Significant moisture stress X cultivar interactions were found for most of the parameters measured. A cumulative drought response index (CDRI) was developed by summing the individual response indices of all cultivars. The CDRI varied between 14.7 and 27.9 among the cultivars tested. Based on CDRI and standard deviation values, five and 28 lines were identified as most sensitive and sensitive to drought, respectively, 45 as moderately sensitive, and 16 and six as most tolerant and highly tolerant, respectively. Cheniere and RU1402174 were identified as the least and most tolerant to drought among 100 lines tested. Even though significant linear correlations were obtained between CDRI and root (R2 = 0.91) and shoot (R2, 0.48) parameters, root traits are important in studying and identifying drought tolerant lines during the seedling establishment stages in rice. The identified rice lines will be a valuable resource for rice breeders to develop new genotypes best suited for drought conditions.

0453

ENVIRONMENTAL INDICATORS FOR SILURFORMES PROCESSING PLANTS AND POSSIBLE FOCAL POINTS OF CONTAMINATION PRIOR AND AFTER FSIS INSPECTION IMPLEMENTATION

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Siluriformes are now under the USDA-FSIS jurisdiction which requires the development of SSOPs to insure adherence to SCPs and hygiene in processing plants. The objective of this work was to determine the prevalence of microbial environmental indicators, including *Listeria* spp., and identify possible points of environmental contamination before and after FSIS jurisdiction. Fifteen food (FCS), five non-food (NFCS) contact surfaces and five liquid samples were assessed for *Listeria* spp., aerobic plate (APC), total coliform (TCC), *E. coli*, and yeast and mold counts, pre-op and post-op, prior and after FSIS jurisdiction of fish plants. Indicator microorganisms were quantified using Petrifilm Plates. *Listeria* spp. identification was conducted using primary and secondary enrichments with standard broths. Samples were streaked on Modified Oxford agar, and presumptive *Listeria* colonies were confirmed by Multiplex PCR. Persistence pre-op, correlation and Tukey's test were performed. APC, TCC and *E. coli* counts and *Listeria* spp. presence were lower ($P \leq 0.05$) pre-op than post-op. *Listeria* spp. was found in floor and drain samples accompanied always by a level of APC above the recommended limit of 2.5 log CFU/cm2, prior and after FSIS jurisdiction. During pre-op, *Listeria* spp. was found in skinner, ice pipe, fish totes, belt before injection, waste belt, and chiller water. There were no differences in indicators when compared before and after FSIS jurisdiction. The results shows that some areas need additional attention to eliminate or minimize microbial indicators including *Listeria* spp. and thus minimize biofilm formation and possible final product contamination.

0454

EFFECT OF AUXIN FORMULATIONS AND WOUNDING ON PROPAGATION OF SHUMAKA™ CRAPE MYRTLE

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The objective of this research was to evaluate ease of rooting and determine optimal commercial auxin formulation and concentration for hardwood cutting propagation of Shumaka™. 12.7-cm medial cuttings were harvested from the parent plant and inserted to a depth of 2.5 cm in propagation medium on 1 Feb. 2017. Propagation medium was 100% perlite placed in 7.6-cm containers. Treatments included two basal wounding treatments (wounded or non-wounded), three auxin formulations [Hortus IBA (Hortus IBA Water Soluble Salts™), Dip'N Grow® (IBA + NAA at 50% the rate of IBA), or Hortus IBA + KNAA (Hortus IBA Water Soluble Salts™ + NAA potassium salt at 50% the rate of IBA)], and three levels of auxin (0, 1000, or 5000 ppm IBA). Data collected after 60 days included rooting percentage, growth index (new shoots), cutting quality (0-5, with 0 = dead and 5 = transplant-ready cutting), total root number, average root length (of three longest roots), and root quality (0-5, with 0=no roots and 5=healthy, vigorous root system). Results showed that rooting percentage, number of roots, average length of the three longest roots, and growth indices were similar among treatment combinations. No benefits were observed from wounding of the cutting. Cuttings dipped in Hortus IBA did have better root quality compared to cuttings dipped in DNG; when Hortus IBA concentration was increased, root and cutting quality and root number increased. Overall, the results suggested that dipping Shumaka™ hardwood cuttings in Hortus IBA at 5000 ppm resulted in a higher quality liner.

0455

QUALITATIVE ANALYSIS OF WATER TREATMENT PRACTICES UTILIZED IN PROCESSING FACILITIES IN MISSISSIPPI

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Phosphate-meat functionality in marination can be reduced due to its ability to pre-react to cations in potable water. While recommended that processors use reverse osmosis, deionized or distilled water for marination, there is not a current practice adoption rate. The objective of this study was to investigate processor's adoption of internal water treatment and determine if water composition has influenced differences in product quality and yield. Assessments were conducted at meat processing facilities (PF) (n=6) in different geographical regions in Mississippi. A plant visit and qualitative survey were used to determine management of water and marination activities. All (n=6) facilities, regardless of size, did not utilize any additional internal water treatment. Reviewers found that 50% (n=3) used municipal water and 50% (n=3) used wells. One plant (n=1) stated it encountered product yield loss when potable water composition and source was changed. Notification of boil water advisories were also cited as a concern at facilities (n=2) where, without immediate notification, may lead to product destruction and profit loss. Results indicate that additional water treatment may be needed to improve product quality and yield, as well as improve safety. Future research will investigate cost-effective water treatment practices for food processing facilities.

0456

SCREENING RICE GENOTYPES FOR DROUGHT STRESS AT EARLY GROWTH STAGE

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Drought stress is one of the major abiotic stresses affecting growth and development of plants at all stages. An experiment was conducted to evaluate 75 rice experimental breeding lines for tolerance to drought stress under pot-culture in mini-greenhouse condition. The rice seedlings were subjected to two different soil moisture regimes, 100 and 50% field capacity, from 10 to 30 days after sowing (DAS). Several morpho-physiological parameters including root traits were measured at the end of the experiment, 30 DAS. Significant moisture stress X cultivar interactions were found for most of the parameters measured. Both root and shoot parameters were found important in studying and identifying drought tolerant lines during the seedling establishment stages in rice, but shoot parameters were more affected as compared to root parameters. A cumulative drought response index (CDRI) was developed by summing the individual response indices of all cultivars. The CDRI varied between 13.5 and 27.5 among the cultivars tested. Based on CDRI and standard deviation values, five and 15 lines were identified as most sensitive and sensitive to drought, respectively, 35 as moderately sensitive, and 13 and seven as most tolerant and highly tolerant, respectively. BR47 and Rex were identified as the least and most tolerant to drought among 75 lines tested. The lines identified as drought tolerant based on morphological parameters, further need to be confirmed by molecular analysis and can be used as a valuable resource in rice breeding programs to develop new genotypes best suited for drought conditions.

0458

EFFECTS OF EXTENDED RETAIL DISPLAY ON AEROBIC BACTERIAL COUNTS AND METMYOGLOBIN REDUCING ACTIVITY IN GROUND BEEF

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The authors of the current study observed an increase in lean redness and percentage of oxymyoglobin in ground beef after 5d of retail display, in contrast to conventional wisdom that beef color continues to deteriorate as retail display progresses. The objective of this study was to evaluate the effects of extended retail display on aerobic plate count (APC) and metmyoglobin reducing activity (MRA) of ground beef. Two retail display trials were conducted using two ground beef batches with 91% and 93% lean. Thirty-six 454-g ground beef loaves per trial were produced, placed on black Styrofoam™ trays, overwrapped with PVC film (O_2 permeability of 1.21 mL/cm^2/d and water vapor permeability of 0.022 g/cm^2/d; LINPAC Packaging-Filmco Inc., Aurora, OH), and displayed at 2^{0}C under fluorescent light (900 lux) for up to 13d. Two randomly selected loaves at each of 18 sampling times in each trial were withdrawn for analyses of MRA by reflectance spectrophotometry and APC by 3M APC Petrifilm™ (3M Corporation, St. Paul, MN). The GLIMMIX procedure of SAS (SAS Institute Inc., Cary, NC) was used for statistical analysis at 0.05 level of significance. The APC was increased from d0 (3.1 log CFU/g) to d7 (3.8 log CFU/g; P=0.022). The MRA remained similar (P³0.220) from d0 to d5 (7.03 to 8.58 µM/min/g). However, compared with d5, MRA was increased on d6 (9.83 µM/min/g; P = 0.027), up to d13 (16.01 µM/min/g; P≤0.004). This discovery potentially leads to applications that enhance shelf life and reduce economic loss of muscle foods.

0460

THE MINERAL CONTENTS OF A POTENTIAL FEEDSTUFF, GUARPRO F-71, FOR LIVESTOCK PRODUCTION IN THE UNITED STATES

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High feed cost is a major economic concern in animal production industries, and nutritionists have been searching for alternative feedstuffs to reduce feed cost. Guar meal is an inexpensive by-product from the guar (Cyamopsis tetragonoba L.) gum industry. Although said to be unpalatable and perhaps toxic in the past, a new guar meal product, GuarPro F-71, possesses promise as an alternative feedstuff due its high protein and carbohydrate contents. As a potential dietary protein source, the amino acid profile of GuarPro F-71 has been previously reported. This study was conducted to test the hypothesis that the mineral contents of GuarPro F-71 are comparable to that of soybean meal. Three GuarPro F-71 samples were randomly collected from a guar meal production line in India and aliquoted to 30 to 100 g/sub-samples after arrival for analysis in three university and commercial laboratories. The results showed that GuarPro F-71 contained (as-fed basis; □SD, n=4) 0.19±0.009% calcium, 0.75±0.018% phosphorus, 0.37±0.012% magnesium, 1.63±0.055% potassium, 119±73 ppm sodium, 182.5±28.03 ppm iron, 20.1±0.81 ppm manganese, 56.9±2.63 ppm zinc, and 10.6±6.61 ppm copper. The sulfur and nickel content was 0.55±0.198% (n=2) and 5.30 ppm (n=1), respectively. When compared to the commonly used soybean meal

(dehulled, solvent extracted), the contents of phosphorus, zinc, magnesium, sulfur, and iron in GuarPro F-71 are approximately 5, 17, 37, 38, and 86% greater, respectively, while the contents of potassium, copper, calcium, manganese, and sodium are approximately 27, 30, 42, 43, and 85% less, respectively. The bioavailability of these minerals, however, warrants further investigation.

0464

RETAINED MOISTURE/WATER, PROXIMATE COMPOSITION AND BACTERIAL LOAD FOR TWO SIZES OF CATFISH FILLETS AT DIFFERENT PROCESS STEPS

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The USDA-FSIS adopted existing meat and poultry net weight and retained water regulations without any modifications for labeling the Siluriformes products including channel (*Ictalurus punctatus*) and hybrid [(*Ictalurus furcatus)´(Ictalurus punctatus*)] catfish. Our current study was conducted to quantify the influence of the size of fillet and process step on the mean proximate composition, retained water and bacterial load of hybrid catfish fillet. Moisture was determined following the oven dry (AOAC 950.46,1990)method and Near-infrared (NIR)spectroscopy. Protein and fat content were determined by NIRspectrometer. Mean moisture, protein and fat content of the unprocessed fillet (baseline) were 77.8 ±1.38%, 16.7±0.50%, and 5.7±1.6%, respectively. The mean retained water of fillet was 2.4±1.5%, 3.8±1.7%, 1.19±2% and 3.09±1.02% after chilling, ice slush, ice packing (fresh product) and freezing (frozen product) respectively. Small fillets (111±19 g) had higher ($P \leq 0.05$) moisture (80.17±1.96% vs 78.68±2.16%) but lower ($P \leq 0.05$) fat content (4.23±1.06% vs 5.9±1.49%) than larger fillets (247±62 g). Size had no influence ($P > 0.05$) on the mean retained water and protein content at any process step. Psychrotrophic (PPC) and Total Coliform (TCC) counts were enumerated using 3M Petrifilm™. Highest bacterial count [PPC (5.08±0.78); TCC (2.96±0.73) log CFU/g)] resulted after polyphosphate injection of the fillet. A multiple linear regression ($P \leq 0.05$, $R^2=0.96$) model [Retained water (%)= 3.48+0.43 (moisture-protein ratio)-0.13 (Fat)%] was established to predict retained water of the fillet using NIR spectrometer regardless of size. This study would contribute to making better decisions on water retention and the microbiological quality in catfish processing.

0470

THE VALUE OF CANOPY COVER: A HEDONIC PRICING STUDY IN LAKELAND, TENNESSEE

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Urban forests have been shown to impact residential property values in the United States and other countries. This study examined the impact of canopy cover on single family residential property values in Lakeland, Tennessee and evaluated potential policy and management implications based on the results. The influence of canopy cover was evaluated using the hedonic pricing method and estimated the effect of tree canopy on the parcel as well as in the surroudning neighborhood. The study revealed that canopy cover on the parcel was not a significant contributor to property values while canopy cover in the neighborhood had significant and positive influences on home sales prices. The marginal benefit of a 1% increase in canopy cover was a 0.12%-0.17% increase in home sales prices. The results suggest that residents of Lakeland, Tennessee value urban forests in their neighborhood more than on their own property. This could inform policymakers in prioritizing forested lands for conservation and aid in the evaluation of economic effects of urban forestry policies and programs. Future studies should explore the effect of this City's, or other similar cities, conservation strategies ex ante ex post as well as examine the influence of forest landownership on surrounding residential property values.

0472

EVALUATING INTERFERENCE POTENTIAL OF WEEDY RICE: STEP TOWARDS BREEDING WEED-SUPPRESSIVE RICE CULTIVARS

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Rice is a vital crop to attain global food security. With increasing shortage of resources there has been a shift in rice establishment method from Puddled Transplanting (PTR) to Direct Seeded Rice (DSR) system. Although DSR uses less resource, weeds are a major yield constraining factor. Herbicide use for controlling weeds has become limited with the development of herbicide resistant weeds in rice production. Development of allelopathic rice can be a good option for sustainable weed management in DSR. Crop improvement programs rely on genetic diversity. Success of weeds in the ecosystem can be attributed to genetic diversity and plasticity. Diverse variation in weedy rice morphology and phenology is present which implies wide genetic diversity. As wild relatives are often explored by plant breeders for crop improvement program, 54

weedy rice accessions- weedy relatives of cultivated rice were evaluated for their interference or weed suppressive potential against barnyardgrass. Three allelopathic rice cultivars (PI312777, PI338046, and RONDO) and two non-allelopathic rice cultivars (CL163, REX) were included as positive and negative control. Accession B2 (61%) had highest interference potential against *E. crus-galli.* Accession B81 had more than 50% inhibition on the growth of *E. crus-galli* a major weed of rice. Morphologically, there was difference in weed suppressive potential of weedy rice with respect to hull type, blackhull being more competitive than straw and brownhull. Potential allelopathic weedy rice accessions were identified and can be used as a source of raw genetic materials in rice breeding programs for developing allelopathic rice cultivars.

0473

USING WEEDY RICE (ORYZA SATIVA SSP.) FOR THE DISCOVERY OF HEAT TOLERANCE TRAITS

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Approximately 250,000 acres of rice is planted in the Mississippi Delta area each year contributing more than $130 million to the state's economy. While favorable for rice, the climate has also given rise to a number of competitive weeds such as weedy rice (WR). WR is a noxious weed with increased competition to cultivated rice in areas of plant height, shatter sensitivity, and panicle length while also proving to withstand extreme climatic conditions. Heat stress tolerant WR could possibly be a source of genetic material for the development of heat stress tolerant rice cultivars. Fifty-four WR accessions were pre-germinated for approximately 3-5 days on filter paper with two positive controls provided by the Mississippi Delta Research Station (DREC), before being subjected to heat stress (37C) inside growth chambers. Plant height was recorded every 7 days for 28 days and vegetative biomass was recorded at the end of 28 days. Results show that nine WR accessions demonstrated 48% increase in height and produced 0.23 g of biomass than the heat-tolerant rice breeding lines provided by DREC. These heat tolerant WR accessions can potentially serve as a valuable genetic resource for rice improvement that can be achieved through conventional or marker-assisted breeding.

0478

ASSESSMENT OF FERTILIZER APPLICATION METHODS USING REMOTE SENSING AND QGIS

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Poultry litter has been shown to be an effective fertilizer in many agricultural systems, but the best application method for this resource has not yet been determined. We compared two methods of application: surface broadcasting and subsurface banding. Surface broadcasting is performed by applying litter over the soil surface, while subsurface banding is accomplished by applying a strip of litter directly beneath the soil surface. In previous research, subsurface banding was found to reduce the volatilization of essential compounds in the litter and to produce yields greater than or equal to traditional fertilizer application methods. The objective of this research was to quantify the effects each application method had on cotton throughout the 2017 growing season at the Pontotoc Ridge - Flatwoods Branch Experiment Station in Pontotoc, MS. We quantified these effects by acquiring LAI, SPAD, multispectral data, and yield. NDVI was calculated using multispectral data collected with a fixed-wing unmanned aerial vehicle. We used QGIS to create georeferenced plot maps and to rapidly extract average NDVI data from each plot. The data indicate the subsurface banding method produces cotton yields equivalent to or greater than the surface broadcast method and that both litter treatments had higher yields than traditional fertilizers.

0481

QQS IN REGULATION OF STARCH METABOLISM IN ARABIDOPSIS LEAVES

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Starch synthesis and degradation play a crucial role in plant metabolism by functioning as storage of reduced carbon during the day and a supply of chemical energy during the night. Little is known about how this complicated process is regulated. Previous research in our group has identified a novel protein QQS (Qua-quine Starch, At3g30720, an *Arabidopsis thaliana* species-specific orphan gene, which exists only in *A. thaliana*). *QQS* negatively regulates the starch synthesis in Arabidopsis. When *QQS* is overexpressed, the leaf starch is decreased; when it is down-regulated, leaf starch is increased. To gain insight to the mechanism how QQS regulates starch accumulation, here, we explore the effects of environmental changes affecting QQS expression and starch metabolism in Arabidopsis mutants with genetic mutations. We use GUS staining to test the expression of GUS driven by QQS promoter, and starch quantification to test the starch content. The results indicate plants may adjust the *QQS* expression and starch accumulation to get adapted to environmental and genetic changes. The experiments have confirmed that QQS is a negative factor in starch

accumulation, and help us understand the mechanism how QQS regulates starch metabolism.

0483

TRADEOFFS OF MANAGING PINE PLANTATIONS FOR HIGHER RETURNS IN OPTIMAL ROTATION AGE OR HIGH-QUALITY SAWTIMBER PRODUCTION IN EXTENDED ROTATION AGE

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Trees from intensive pine plantations are being harvested in an early age to ensure higher yield which results in the production of more juvenile wood of inferior quality. Although waiting to harvest older trees allows trees to produce higher quality wood, it incurs additional costs to forest landowners who might be interested in receiving a premium price as compensation for delaying the final harvest. However, no information is available regarding economic tradeoffs between managing pine plantations for the higher returns in an optimal rotation age or high-quality timber production in an extended rotation age. Therefore, we modeled southern yellow pine plantations to quantify a price premium that forest landowners need for growing higher quality pine sawtimber by delaying the final harvest age in the Lower Coastal Plain of southern USA. We used Forest Vegetation Simulator southern variant for growth and yield modeling of southern yellow pines. Land Expectation Values were calculated to determine financially optimal rotation ages and extended rotation ages. The optimal rotation was found at the age of 35 and 47 for loblolly and longleaf pine, respectively. Similarly, compensatory rates to justify 10, 20, 30, 40 and 50 years final harvest delay from optimal rotation were found to be 3.76$/ac, 7.60$/ac,11.41$/ac, 15.25$/ac and 18.89$/ac respectively for loblolly pine plantations and 2.25$/ac, 5.36 $/ac,7.63$/ac, 9.76$/ac and 11.68$/ac respectively for longleaf pine plantations. The findings could help the forest landowner make decisions pertaining to whether their forest is managed for growing higher quality pine sawtimber delaying the final harvest age.

0484

INVESTIGATING AND MODELING SOYBEAN EMERGENCE, FLOWERING, AND MATURITY BASED ON TEMPERATURE

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Temperature can be used to simulate soybean (Glycine max [L.] Merr) phenology because it impacts many biochemical pathways and that leads to the appearance of certain developmental stages at the whole plant level. Three experiments were conducted to model soybean emergence, flowering, and maturity based on temperature using sunlit growth chambers. One soybean cultivar, Asgrow AG533, and five day/night temperature were used. Temperature treatments were imposed immediately after planting, after emergence, and from flowering up to maturity to develop emergence, flowering, and maturity models respectively. Quadratic responses were the best describe the relationship between soybean phenology events and temperature. The results indicated there was a high correlation between temperature and soybean and emergence, flowering, and maturity with R^2 = 0.93, 0.93, and 0.84 respectively. Also, series of experiments were conducted in outdoor conditions to validate the models that developed in this study. By planting several cultivars to validate the models, the results indicated a high correlation between the predicted and observed values with R^2 =0.91 for the emergence and 0.96 for the flowering model after using fixing factor. The functional algorithms presented here will be useful to improve the functionality of soybean models for field applications and to help adjust soybean management decisions such as cultivar selection and planting dates depending on the niche environment.

0488

THE CALIBRATION OF FEED DELIVERY RATES IN AN AUTOMATED FISH VACCINATION SYSTEM

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Catfish production is a prominent economic activity in Mississippi. A detrimental complication in catfish production can be diseases such as enteric septicemia of catfish (ESC), which needs to be prevented. An automated fish vaccination system has been developed using pulse width modulated valve to control the vaccination feed rate. The objectives of this study are to: calibrate the automated fish vaccination system for manufacturing and to discover any variances between the two duplicated systems. The fish vaccination delivery system applies an ESC vaccine directly to fish feed to be distributed into stocked fishponds. The system has the capabilities to run at many different hertz, various feed types, and several vaccine spray rates. The experiment was conducted for the six different feed rates, 10 to 60 Hz, with complete random design of experiments in two similar feeding systems (machines). In this research study, feed is applied dry through the delivery system with a duration of thirty seconds per sample. For each rate, seven samples are collected for each session of feed collection. The data collection process was replicated 5 times. Through this study, the calibration of the fish vaccination system will allow for feed optimization.

0492

IDENTIFICATION OF BRUISED APPLES USING A 3-D IMAGING AND FEATURE EXTRACTION ALGORITHM

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Abstract— In this paper, we propose an algorithm for identifying bruised apples based on 3D shape information obtained by a 3D infrared imaging system. The algorithm aims at classifying apples into two classes: bruised apples and un-bruised apples. We introduce a vertex-based mesh local binary pattern operator to extract binary patterns from 3D meshes. For classification, we apply a support vector machine (SVM) classifier to train the feature vectors generated from the histograms of feature codes. We investigated the optimized parameters of the proposed algorithm to achieve the highest identification accuracy. The comparison of the proposed algorithm with other algorithms has been conducted. Experimental results show that the proposed algorithm achieved better performance for bruised apple identification than traditional algorithms.

0493

ANNUAL RYEGRASS PLOIDY INFLUENCE ON WEIGHT GAIN OF CATTLE

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Annual ryegrass (*Lolium multiflorum* Lam.) can be divided into two cytotypes: diploid (2n=2x) or tetraploid (2n=4x). Improving the genetics of annual ryegrass from diploid to tetraploids results in increased seedling vigor, more robust growth and thus supposedly greater yield. However, conflicting research suggests no difference in yield between diploid and tetraploid varieties. If there is no difference in yield between cytotypes, then there may be a weight gain advantage in cattle grazing tetraploid cytotypes. To determine if there is an advantage in average daily gain in steers grazing diploid and tetraploid ryegrass, this research took place at H. H. Leveck Animal Research Centre in Starkville, MS. Four varieties, Marshall (2x), Tam 90 (2x), Jumbo (4x) and Nelson (4x) were planted in 0.81 ha pastures replicated four times. Four steers were randomly assigned to each of the 16 paddocks for an 82 day grazing period. Weights were taken for each steer staring at day zero and then every 28 days throughout the season. Results indicated that there are no significant differences in cattle grazing between cytotypes. However, there are differences in weight gain of cattle grazing between varieties. Final ADG for cattle grazing Tam 90 (1.10 kg d^{-1}) were greater than Marshall (0.92 kg d^{-1}). While the variability around the mean for cattle grazing Nelson (1.03 kg d^{-1}) and Jumbo (1.00 kg d^{-1}) fell into the same category as Tam 90 and Marshall. Other parameters measured included: plant heights, dry matter yield, in vitro dry matter digestibility, and relative forage quality.

0495

LANDOWNER WILLINGNESS TO PARTICIPATE IN CONSERVATION PROGRAM FACILITATING ECOSYSTEM SERVICES

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Bottomland hardwood forests and open pine stands provide valuable ecosystem services such as wildlife habitat, carbon sequestration, floodwater storage, and sediment and nutrient retention. However, these forest ecosystems are threatened because of forestland conversion, invasion of exotic species, and urbanization. This study employed a mail survey and contingent valuation method to determine landowner willingness to accept compensation for participating in a conservation program facilitating provision of ecosystem services in the southern United States. Data were analyzed using a logistic regression model to quantify willingness to participate in the program at offered monetary compensation, and identify impact of landowner preferences and attitudes on willingness to participate. Results indicated that compensation amount, and concern with loss of open spaces were significant predictors of landowner decision to participate in a conservation program that focused on bottomland hardwood forests. Landowners affiliated with forestry and environmental organizations were five and seven times more likely to participate in the program, whereas landowners affiliated with wildlife and agriculture related organizations were not likely to participate in the program at an offered compensation level than non-members. Similarly, significant predictors of enrollment decision in pine stands conservation program include bid amount, owning land for maintaining wildlife habitat and frequency of contact with local conservation groups. Landowner's mean willingness to accept compensation was US$ 153/acre/year and US$ 170/acre/year for enrolling in bottomland hardwoods and pine stands conservation programs respectively. The findings help to identify likely participants for both types of conservation programs and determine actual conservations costs at landscape level.

0498

BREEDING A HEAT TOLERANT ANNUAL RYEGRASS FOR EARLIER FALL PLANTING IN MISSISSIPPI

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Annual ryegrass is a cool-season forage grass that is used as a winter feedstuff for beef operations throughout the southeastern United States. Late summer or early fall planting of annual ryegrass is highly desirable to producers, as it increases available forage to their cattle earlier in the season. However, temperatures during this period in states such as Mississippi, Alabama, Georgia, and Texas often exceed 32°C. These temperatures are highly detrimental to annual ryegrass production, thus creating the need for a heat tolerant annual ryegrass cultivar that can germinate and survive heat stresses as a seedling. Our objective was to use recurrent phenotypic selection to develop a heat tolerant annual ryegrass cultivar that will germinate and grow earlier in the growing season. Seed of the cultivar Marshall underwent germination tests in growth chambers at 40°C in 2015, 2016, and 2017. Seedlings that successfully germinated and survived under the 40°C conditions for two weeks were selected for advancement to cycle 1, cycle 2, and cycle 3. By 2017, seed from cycle 2 were compared to the original population of Marshall to determine if an increase in germination had been made. We observed a significant increase ($P < 0.05$) in germination of cycle 2 (18.6%) over cycle 0 (2.7%) at 40°C. Further cycles of selection are currently being examined for further improvements.

0501

GREENHOUSE SCREENING TO DETECT DICAMBA, 2,4-D AND QUINCLORAC TOLERANT SELECTED TOMATO ACCESSIONS

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Injury on tomato (*Solanum lycopersicum*) from 2,4-D, dicamba, quinclorac and glyphosate were shown at rates as low as 0.01X (as a drift rate). With the new crop technology, which includes 2,4-D and dicamba resistant crops, there will be increased usage of these herbicides causing more severe drift problems. There is a diverse germplasm of tomato that includes wild relatives known to be tolerant to numerous biotic and abiotic stresses. Three tomato accessions (1453, 1461 and 2662) selected from a preliminary study using 110 wild tomato accessions, and 2 cultivars (Better Boy and Money Maker) were used in the greenhouse bioassay screening. 2,4-D, dicamba and quinclorac were applied at simulated drift rate of 11.2, 2.8, and 39.2 g ae/ha, respectively. Visual injury rating of each accession for each herbicide treatment was taken at 7, 14, 21 and 28 DAT on the scale of 0-100%. Results indicate all the three wild tomato accessions to be tolerant to dicmaba only with less than 15% injury; both cultivars showed 100% injury with dicamba. The three wild accessions (1461, 1453 and 2662) did not show any significant reduction in plant height compared to un-treated plants. At 28 DAT, plant height of 1461, 1453 and 2662, were 25, 25, 28 cm when treated with dicmaba, and 31, 30, 31 cm untreated, respectively. Based on our results, these lines can be used to develop herbicide tolerant tomatoes that will help minimize or eliminate the negative impact of drift from non-labeled herbicides tested in this project.

0502

ASSESSMENT OF NATIVE WARM SEASON GRASSES FOR POST-MINING RECLAMATION

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Surface strip mining disrupts the land surface in order to obtain subsurface substances, including coal. Red Hills Mine (RHM), located in Ackerman, MS, is a current large scale strip mine for lignite. The objective of this study is to evaluate yield of native warm season grasses compared to bermudagrass. Big bluestem (*Andropogon gerardii* Vitman), little bluestem (*Schizachyrium scoparium* (Michx.) Nash.), indiangrass (*Sorghastrum nutans* (L.) Nash.), and upland switchgrass (*Panicum virgatum* L.) were the species included in this study. Bermudagrass and four native warm season grass test plots were established in the summers of 2015 and 2016. Harvests were performed early season, mid-season, and end of season to compare yields between the native warm season grasses and bermudagrass with and without nitrogen application. Data indicate native warm season grasses, except upland switchgrass, produced greater yields compared to bermudagrass in mid-season harvests. End of season harvests showed all species with applied nitrogen had greater yields than species without supplemental nitrogen. A species by replication interaction was present. Greater yields of native warm season grasses were found in replication 1, while yields in replication 3 were the least. Little bluestem produced the greatest yields for mid-season and end of season harvests.

0506

FRAZE MOWING AND TIMING OF OVERSEEDING ESTABLISHMENT

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Overseedingof bermudagrass (*Cynondondactylon*) with perennial ryegrass (*Loliumperrene*) can be both rewarding and problematic. Frazemowing offers a new tool that can be used in perennial ryegrass establishment. The objective of our study was to determine the most effective timing of frazemowing for perennial ryegrass establishment; as

well as to compare frazemowing to other methods currently established.

The treatments were performed three times during the fall to remove or disturb bermudagrass growth. The methods used were frazemowing at multiple heights, scalping, and vertical mowing followed by perennial ryegrass seed application. Measurements were taken weekly to evaluate the performance of the treatments both visually and through standard turfgrass evaluation devices.

Results of our study found frazemowing provides a faster establishment of perennial ryegrass, but by March 1 all treatments were visually the same. The October 31 treatment showed the slowest establishment as the perennial ryegrass did not have an optimum amount of heat units to develop density. Scalping was also effective in promoting perennial ryegrass development.

0507

EFFECT OF SAMPLE-PLOT SIZE AND DIAMETER-STATISTICS PREDICTION MODEL FORM ON STAND DIAMETER DISTRIBUTION RECOVERY METHOD

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Diameter distribution of a forest stand provides insights into the stand's value. In whole stand forest growth and yield prediction systems, the future diameter distribution of a stand gets predicted by use of models that predict the stand's diameter statistical moments and/or percentiles in conjunction with a mathematical system to recover the diameter distribution from the predicted moments and/or percentiles. Weibull probability distribution is widely used to model the predicted diameter distribution. Studies that have compared Weibull diameter distribution recovery systems based on moments only to those based on moment-percentile hybrid approaches arrived at varied conclusions regarding the best approach of recovering a stand's future diameter distribution from predicted stand level statistics. In the current study, quantity of data used in model development as well as the form of diameter moments/percentiles prediction models were assessed in terms of how they affect the accuracy of three Weibull distribution recovery approaches - method of moments, percentile, and moments-percentile hybrid. Data from five plot sizes were used to fit each moments/percentile prediction model used to recover Weibull diameter distributions. Prediction error was calculated by comparing each plot's predicted timber yield (green tons/acre) to its respective observed yield. Across the model forms and diameter distribution recovery approaches investigated, prediction error was smaller the larger the size of plot used to develop the diameter recovery system. There was some evidence of interaction between plot-size and the diameter distribution recovery approaches but no evidence of interaction between diameter-statistics prediction model form and the recovery approaches.

0508

COMPARATIVE GENOMIC ANALYSIS OF VIRULENCE FACTORS IN THE *AEROMONAS* GENUS

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Members of the *Aeromonas* genus are gram-negative, facultative anaerobic, rod-shaped aquatic bacteria with a plethora of known virulence factors. *Aeromonas* has been isolated from a wide array of sources: sediments, various foods, fish, drinking water, and humans. For instance, *Aeromonas hydrophila* is currently ravaging various aquaculture systems in the U.S. and China, resulting in large economic losses. Virulence factors are bacterial components that play an important role in infection. To identify virulence factors for specific species, we undertook a novel analysis of the entire available *Aeromonas* genus using current bioinformatic methods. To conduct this approach, 276 *Aeromonas* genome sequences were retrieved from NCBI and searched against VFDB (Virulence Factors Database) using the BLAST method. Unique virulence factors were identified for each *Aeromonas* species, as well as core virulence factors that are promising for development of a novel vaccine. In summary, the current research has potential to alleviate stress *Aeromonas* has caused to the global commercial aquaculture industry and decrease the risk of human infections.

0509

IMPACT OF VOLUNTEERING IN AN EQUINE ASSISTED ACTIVITIES PROGRAM ON UNIVERSITY STUDENTS

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Volunteer involvement is vital for equine assisted activities (EAA) programs. EAA programs and universities can benefit from mutualistic learning opportunities via volunteering, but quantification of the impacts of these programs is necessary for universities. The objective of this study was to evaluate the impact of volunteer experience in an EAA program for university students using a survey instrument. Student EAA volunteers enrolled at a University were given a survey before (n=74) and after (n=14) volunteering that evaluated students' perceived views of their equine knowledge, skill level, confidence,

and opinions of EAA. While no prior horse experience was required for volunteering, 49% of volunteers had greater than two years of riding. Despite this experience, 36% indicated prior to volunteering uncertainty in their ability to select and train EAA horses and 46% stated that they were unfamiliar with EAA career opportunities. At the end of volunteering, the post- survey revealed that 64% were either "very confident" or "confident" in their EAA horse selection and training abilities and 93% felt "very confident" in their understanding of EAA career opportunities. The volunteer experience not only strengthens their understanding of the diversity of the equine industry, but also broadens the career path of these students.

0510

SMALL NONCODING RNA OF SPERM AND EGG REGULATING FERTILITY IN MAMMALS

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Fertility, ability of the spermatozoon and oocyte to undergo syngamy to form developmentally competent zygote and early embryo, is essential for propagation of species. Although small noncoding Ribonucleic acids (snRNA) are known to regulate gene expression during mammalian development, paternal and maternal effect snRNA controlling fertility are poorly defined. The gaps in the knowledge base are important because they are hindering the advancement of fundamental science and biotechnology of mammalian developmental biology and reproduction. The objective of this study was to test the hypothesis that paternal and maternal effect snRNA regulate fertilization, embryonic and fetal development at the onset of life. Bioinformatic approaches including gene ontology, pathway enrichment analysis, and network analysis were employed to ascertain sperm-and oocyte-born snRNA and their functions. The results indicate that there were 4,247 sperm and oocyte born miRNAs targetting 224 different genes in mammalian gametes. The interactomes and pathways for Bos Taurus revealed that BSPH1, SPACA3, SPA17, OOEP, and SPAM1 genes have significant gene ontology terms for fertilization ($p<0.0001$). Additionally, great numbers of miRNA families are conserved among mammals. These findings are significant because they help advance fundamental science of mammalian gamete development and reproductive biotechnology.

0512

CO-REGULATION OF THE GLYCINE MAX SNAP RECEPTOR (SNARE) CONTAINING REGULON OCCURS DURING DEFENSE TO A ROOT PATHOGEN

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Heterodera glycines also known as Soybean Cyst Nematode is a major pathogen of soybean (Glycine max) that causes more than a billion-dollar loss in the U.S. annually. Various strategies such as plant breeding, crop rotation, biocontrol, nematicides are in practice to control this pathogen but the success is minimum. Closer study of the infected cells in resistant variety G. max [Peking/PI548402] and the susceptible variety G. max [Williams 82(PI518671)] through laser microdissection have revealed various unique genes that are present in G. max [Peking/PI548402]. Overexpression of these unique genes in susceptible cultivar G. max [Williams 82(PI518671)] resulted resistance by inducing incompatible reaction and RNA interference of these genes in resistant genotypes resulted susceptible reaction by inducing a compatible reaction. In this approach, we have overexpressed the components of the Soluble N-ethylmaleimide-sensitive fusion (NSF) Attachment Protein (SNAP) REceptor (SNARE) complex that helps in docking of the vesicles to the membrane and subsequent release of the vesicular contents to the apoplast. Experiments show that Syntaxin 121, Glycine max homolog of Saccharomyces cerevisiae Suppressor of sec1 (SSO1) identified genetically in Arabidopsis thaliana as PENETRATION1 (PEN1), are co-expressed with homologs of SNARE genes inducing resistance to H glycines. Similarly, the SNARE genes are coregulated along with a beta-glucosidase having homology to PEN2 and an ATP binding cassette transporter exhibiting homology to PEN3. Thus, focusing on the actual cellular mechanism of resistance and implicating host resistance against this devastating pathogen can help minimize yield loss thereby saving billions of dollars loss worldwide.

0515

IDENTIFICATION OF ROOT KNOT NEMATODE STRESS RESPONSE PATHWAYS IN *GOSSYPIUM HIRSUTUM*

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Crop losses attributed to biotic and abiotic stresses dampen the individual incomes and livelihoods of farmers around the world and - too often - threaten the agricultural securities of entire nations. The identification, characterization, and integration of novel stress response pathways will allow for the reduction of stress-induced

crop yield loss. This project seeks to identify and validate sources of plant stress resistance in the globally important cotton plant - *Gossypium hirsutum*. For this purpose, a novel ortholog identification pipeline is being developed, which has allowed for a critical re-examination of the MAP3K gene family in seven plant species. ILK1, a MAP3K Raf-like protein kinase recently characterized as a source of resistance against pathogen infection in *Arabidopsis thaliana*, was selected for functional characterization in *Gossypium hirsutum* against the Root Knot Nematode (RKN) agricultural parasite. Candidate orthologs of ILK1 were identified in *Gossypium hirsutum* and knockdown mutants were generated using Viral Induced Gene Silencing (VIGS). When challenged with RKN infestation, silenced mutants displayed strong increases in RKN susceptibility, supporting a critical role for ILK1 in biotic stress response. This study places ILK1 as the second gene discovered to have a direct role in mediating cotton resistance to RKN. Future plans involve using RNA-seq data to resolve downstream pathway components. The continued identification and validation of stress response pathways will allow plant breeders to generate more productive and efficient genotypes able to reliably sustain the food and fiber needs of the world.

0516

MOLECULAR SIGNALING PATHWAYS ASSOCIATED WITH AFLATOXIN REDUCTION IN CORN

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*Aspergillus flavus*is a detrimental fungus to the corn crops of the United States due to the production of the hazardous secondary metabolite, aflatoxin. The contamination of aflatoxin in corn crops renders the product unsafe for consumption and thereby results in loss to farmers. The understanding of genes related to *A. flavus* resistance in corn is important to improve corn crop production against this fungal pathogen. This study involved analyzing genes related to the plant-pathogen interaction pathways among a set of 12 corn near-isogenic lines (NILs), the two parental corn lines Mp313E(resistant) and Va35(susceptible), and the hybrid F1 line. These 12 NILs contained previously identified quantitative trait loci (QTL) associated with *A. flavus*resistance in corn. A total of eight calcium-dependent protein kinases, three calcium calmodulin/calmodulin-like proteins, and one respiratory burst oxidase displayed significant differences in mRNA expression level among the NILs at $p<0.05$, $p<0.1$, and $p<0.5$, respectively. This study also examined the gene expression profiles of WRKY transcription factors. WRKY 52, WRKY 71, and WRKY72 displayed significant differences at $p<0.05$. The elucidation of genes involved with *A. flavus* resistance can enhance corn crop breeding as well as prevent financial loss for growers.

0517

EVALUATION OF PROTEIN EXTRACTION METHODOLOGIES OF CORN LEAF TISSUE FOR TWO-DIMENSIONAL SDS-PAGE

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Although corn leaf tissue is naturally vulnerable to insect attack and fungal infection, there are maize lines with resistance to these pathogens. These resistant lines have unique defense mechanisms. Isolating these differences may allow us to pinpoint specific defense proteins responsible for these resistances to one day grow a stronger corn plant. Two-dimensional SDS-PAGE (2-DE) is an effective method to view protein differences. It is difficult to produce quality gels with 2-DE of corn leaf tissue due to interfering contaminants and low protein content. An effective protein extraction method must be utilized in order to circumvent these challenges. Studies specifically focused on determining effective protein extraction methods with corn leaf tissue are limited. Distinguishing an effective method is a vital step toward producing well resolved gels. Multiple extraction methods were explored including preparation with acetone washes, trichloroacetic acid / acetone precipitation, and SDS / phenol extraction and ammonium acetate precipitation. The plant total protein extraction kit from Sigma-Aldrich was also evaluated. Proteins extracted from each method were loaded onto SDS-PAGE and 2-DE for gel quality comparison.

0518

EFFECT OF THE BENOXACOR AND FENCLORIN SAFENERS FOR USE IN TOMATO CROP IN PROVIDING PROTECTION AGAINST HERBICIDES

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The use of herbicides is one of the most effective methods to control weeds, but they can often be unsafe on crops. Safeners can be added to the spray solution to improve the crop protection. The aim of the present study was to

evaluate the effect of the benoxacor and fenclorin safeners for use in tomato crop in providing protection against herbicides such as pyroxasulfone, flumioxazin, metribuzin, imazamox, fomesafen, sulfentrazone, bicyclopyrone and linuron. The experimental design was completely randomized with four replicates, in a factorial scheme 9 x 3, in which Factor A corresponded to the applied herbicide and Factor B being the applied safeners. The analyzed variables were visual injury at 3, 7, 14, and 21 days after application (DAA). At 21 DAA, the dry masses of tomato were determined. By 21 DAA, a significant reduction of the injury in the tomato treated with safener benoxacor and fenclorin of 25 and 22,6%, respectively, was observed only where byciclopyrone was applied. Whereas the safener benoxacor reduced the injury of the tomato plants after the application of imazamox in 82%. The Benoxacor safener provided biomass increase regarding the control treatment of 46% and for the herbicides pyroxasulfone 135% and metribuzin 72%. While for the fenclorin safener, the increase of biomass in relation to the control treatment was observed in the application of the herbicides metribuzin (87%), imazamox (106%) and fomesafen (124%). Thus, benoxacor and fenclorin safeners have the potential to reduce injury in treatment with the herbicides pyroxasulfone, metribuzin, imazamox, fomesafen.

0519

GOING PAST GWAS: THE PATHWAY ASSOCIATION STUDY TOOL

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Aspergillus flavus, a fungus that infects corn plants, produces a harmful carcinogen known as aflatoxin, which causes severe health and economic problems. Genome-wide association study (GWAS) allows scientists to identify genes linked to a trait of interest (i.e., aflatoxin resistance), but does not identify all genes for a trait, due to low statistical power and lack of suitable analysis tools. To remedy this, metabolic pathways consisting of multiple genes that work together are being analyzed to identify resistance mechanisms. A program was created that filters GWAS results, links single nucleotide polymorphisms (SNPs) to genes, assigns genes to pathways, and creates rugplots showing information about significant pathways. However, that program was coded in a mixture of R and Perl; consists of multiple scripts which each have to be started manually using the output of the previous script; and runs unacceptably slowly. Because of these difficulties with the program, it is not being used by scientists in other labs. A new implementation of these scripts is being entirely coded as a freely available R package that utilizes R's multiple statistics-based functions to efficiently filter and format SNP data. The package easily reads GWAS datasets and links SNPs to genes using linkage disequilibrium data, and assigns those genes to pathways using online databases. Finally, it assigns significance to pathways and produces rugplots showing significant pathways and their genes. The end product will be a user-friendly package that can efficiently read and run GWAS data in multiple formats for different plant species and traits.

0523

DATA-DRIVEN PRECISION AGRICULTURAL APPLICATIONS USING FIELD SENSORS AND UNMANNED AERIAL VEHICLE (UAV)

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In recent years, dramatic evolution of precision agriculture technology has been driven by technologies: sensors and controllers, telematics, and Unmanned Aerial Vehicle (UAV). The objective of this study was to validate the crop data acquisition procedure and the crop relationship with different type of data acquisition technique. In particular, this paper will compare ground based active optical sensor data collection with UAV imagery for site-specific N management. The randomized complete block plantation experimental design was used with four treatments and four replicates. The plots were 12 rows wide at 38" spacing and were 125 ft. in length. Green seeker field sensor and Micasense sensor for UAV was used to evaluate the Normalized Difference Vegetation Index (NDVI). The results showed that UAV assessed NDVI are good indicator of crop nutrition along with the ground-based crop sensors. The result of the statistical data analysis showed that NDVI values are dependent on nitrogen application rate. The average NDVI value for no nitrogen application was recorded 0.54 whereas for 240 kg/acre nitrogen application was noted to be 0.76. Crucially, this correlation holds true for definite extent of nitrogen application rate. Because there wasn't any significant change in NDVI for 160 and 240 kg/acre. The NDVI values being 0.74 and 0.76 respectively. The results are significant because it shows the potential of further validating the use of aerial imagery derived NDVI for real time application of crop nutrient. This research has also proven that UAV are reliable platform for nutrient assessment and crop management decisions.

0530

IMPROVING SOIL HEALTH WITH WINTER LEGUMINOUS COVER CROPS IN AN EARLY-PLANTED MISSISSIPPI CORN PRODUCTION SYSTEM

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Cover crops continue to be a popular use of leguminous forage species in commodity cropping systems. Agronomic benefits of leguminous cover crops include; soil stability and nutrient scavenging, which are associated with a longer season of row crop growth. Establishment of a leguminous cover crop following an early-planted/early-harvested Mississippi corn production system ideally requires cover crop planting in early September and terminating of the cover crop in March. This study was arranged as a randomize complete block design comparing plant emergence, weed suppression, cover crop impact on macronutrients held within the senescing cover crop, biomass accumulation, and corn emergence. The treatments in this study are; four cool-season legume species [(balansa clover (T. michelianum Savi.), berseem clover (T. alexandrinum L.), crimson clover (T. incarnatum L.) and hairy vetch (Vicia villosa Roth.)] compared to four chemical nitrogen rates (56, 112, 168, and 224 kg N ha-1). Statistical analysis was conducted using PROC MIXED; α=0.05. The benefits of cover crops were assessed on 38" rows followed by fallow planted corn (P0339AM). Crimson clover plant emergence was significantly greater than the other legume species. While hairy vetch plant numbers were lower, weed suppression was as good as crimson clover and significantly greater than the other test species. Cover crop nitrogen and phosphorus concentration was significantly greater in balansa clover and hairy vetch that the other two test species. In the future, suppressing weeds while using elemental nutrients, and organic matter stored in cover crop could improve soil healthy while reducing farmer's fertilizer input cost.

0531

NEAR INFRARED SPECTROSCOPIC ANALYSIS MODE CLONING (NIR-AMC) FOR DETERMINING IN-SITU NUTRITIONAL PARAMETERS OF FORAGE GRASSES

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Quantitative and qualitative information on the composition of plant materials can be obtained using Near Infrared Spectroscopy (NIR) coupled with mathematical transforms and analyzed with multivariate statistics. Our goal was to evaluate nutrients in fresh forage grasses based on spectral calibrations built from finely ground samples. Here, we describe the generation of a master prediction model and translation of it to the satellite sample processing modes as NIR-AMC (Analysis Mode Cloning). Bamboo leaves (*Phyllostachys rubromarginata, Pseudosasa japonica*) were obtained bi-weekly for 21 months and scanned using an ASD FieldSpec®3 portable spectrometer. Three types of processing modes were analyzed, with the 'Master Mode' defined by 'dried-ground' samples (Udy Corp.), for which nutrient reference values of crude protein, lignin, fat, and potassium were determined by chemical analysis (Forage Labs, Cumberland MD). The other two modes were dried 'coarsely-ground' leaves (Wiley Mill, Thomas®) and 'fresh-whole' leaves. The chemometric analysis (Unscrambler® X v.10.4; CAMO) for the 'Master Mode' applied partial least squares regression (PLSR) on the full data spectrum (700-2400nm). The coefficient of determination for nutrient prediction ranged from 0.92-0.95 and 0.77-0.98 for calibrations and validations, respectively. The 'Coarse-ground' satellite mode was analyzed using the 'Master Mode' model and displayed similar prediction values for all nutrients except lignin. Nutrient prediction in 'fresh- whole' leaves requires co-fitting of both absorption and second derivative spectra to select the optimized wavelength range to compensate for, or avoid, the interference of water band signals.

0532

THE IMPACT OF DIETARY ARGININE ON BOAR SEMEN QUALITY

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In animal studies arginine has proven to elicit an improvement in motility, morphology, and sperm count. This experiment examined the impact of dietary arginine on quality of boar spermatozoa. Stored frozen boar semen straws were taken from a nitrogen tank, thawed using a water bath, and then samples were diluted using thawing solution. Samples were then loaded into a Ceros II Analyser (Hamilton Thorne, MA, USA) and HT Casa II software was used to microscopically analyze sample motility. Samples were then analyzed in the Guava easyCyte flow cytometer (Millipore Sigma, MA, USA) using ViaCount and MitoDamage kits.

ViaCount displayed the number of viable spermatozoa versus dead. MitoDamage kit quantified the number of sperm cells undergoing apoptosis and mitochondrial potential of sperm. Microscopic analysis of spermatozoa produced ununiform, varying ranges of motility in controls and arginine treated boars. This infers that differences were not caused by treated and untreated semen samples, but instead, differences seen amongst individual boars. ViaCount percentages for all samples were roughly identical. Although deviations were detected in the volume of cells per milliliter, this could be due to the

number of previous ejaculations and sperm count variations between boars. MitoDamage produced favorable results for both the control and treated samples concerning apoptotic cells, membrane integrity, and mitochondrial potential, but no differences were between the control versus the treated. Based on information gathered from control samples and arginine containing samples, arginine neither positively affected nor negatively impacted sperm quality. Works supported by USDA-ARS Biophotonics Initiative #58-6402-3-018.

0535

TEMPERATURE EFFECTS ON *BRASSICA CARINATA* GROWTH AND DEVELOPMENT

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Brassica carinata (BC), Ethiopian mustard, is a potential alternate non-edible biofuel feedstock crop for the US Southeast because of its relatively high concentration of erucic acid. Information on how this crop responds to temperature are prerequisite in developing models to determine potential areas and planting date options for its growth and development. Crops planted during fall or early spring will be subjected variable temperatures during early-season. In addition, temperature effects on BC root system is also not available. The objectives of this study was to study BC above- and belowground growth and developmental responses to a wide range of temperatures, 18/10, 23/15, 28/20, 33/25, and 38/30°C under optimum water and nutrient conditions for plants grown in sunlit plant growth chambers. Both above- and below-ground growth and developmental parameters were recorded three weeks after sowing and two weeks after temperature treatment. The cardinal temperatures varied among the processes. The minimum, optimum and maximum temperatures for most growth processes were 15, 27.5, and 40 °C while leaf developmental rates increased from 13.4°C base temperature to 30°C and declined at higher temperatures. The temperature-dependent above- and belowground growth and developmental responses of BC will be useful in assisting management and in developing models for on-farm and research and policy decisions.

0537

EVALUATION OF ACCURACY OF HANDHELD DEVICES FOR GNSS/GPS USED IN GEOREFERENCED DATA COLLECTING

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The Global Navigation Satellite System (**GNSS**) consists of space-based positioning, navigation and timing for civilian activities. GNSS/GPS has been used to record location based data and applying variable rates of inputs in precision agriculture. Currently many handheld devices are used to collect data for precision agriculture. The spatial accuracy of GPS receivers on these devices used in precision farming is as important as the collected data. The horizontal accuracy of the handheld devices such as smartphones, iPad and mini-handheld computers are critical to the quality of data. This research study has attempted to compare accuracy of GPS signals received by five devices, namely, iPhone, Samsung, Asus, Trimble Juno and Trimble Yuma. The cost of the devices is in the range of $200 to $2000 and expected accuracy would also vary accordingly. As the first step, a mobile application was developed for iOS and android in order to read and record mobile GPS data. Then, 30 Ground Control Points (GCP) with 25ft distance were assigned on the ground, and geolocation of all points were extracted by Google Earth. The spatial location was also recorded by the five devices. The geolocation of each point by Google Earth was considered standard and the errors of position recorded by each device were computed for each point separately. Results show that Trimble Juno and Trimble Yuma have provided better accuracy respectively and iPhone is more accurate in comparison to other smart phones. The users may select the device based on their required accuracy and affordability.

0539

SICKLEPOD SEED EXTRACT AS AN EFFECTIVE DEER REPELLENT TO PROTECT SOYBEAN: FIELD DATA

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Deer damage on row crops such as soybean is a perceived problem in the continental US. This project tested sicklepod seed extract as a deer repellent in field. The field tests were conducted in two locations separated by around 12 miles: North Farm (NF) (33°26’42”N88°46’36”W) and Longview (LV) (33°24’40”N88°56’31”W). The NF experiments were to compare the repelling effect of sicklepod extract and three commercial deer repellents (Hinder (H), Liquid Fence (LF) and Flight control plus (FCP)) plus water as a control. Deer repellent application rates were following the commercial label instructions for dilution at 20 gallons/acre. Sicklepod extract was prepared at 500 mL/100 g seed. North Farm had fairly high deer pressure. However, there were more soybean rows beyond our experimental area, which lead to the failure of the main goal. The Longview experiments were designed with the same purpose, but at higher deer pressure. Soybean were grown in trays (11 x 21 x 2.5 in) in greenhouse for one month then transported to the site for browsing tests. The application rates were three times of the commercial rate. Under such application rate, the repelling tests lasted one

week until frost killed the soybean plants on Nov. 20 and the repelling effectiveness was tested to follow the order: LF > Sicklepod > Hinder > FCP.

So far, Hinder is the only deer repellent authorized by EPA to apply on food crops. Hence sicklepod extract is potentially the best deer repellent for food crops and vegetables.

0544

IMPACT OF LIPOSOMES ON BOAR SEMEN QUALITY POST FREEZING

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Sperm cryopreservation freeze-thawing methods of boar is very inefficient and unreliable leading to decreased sperm function and survival. An egg yolk extender is widely used but risks contamination and may compromise samples. Liposomes are spherical vesicles made up of a phospholipid bilayer, extensively used for drug transport and administration. Liposomes may be an improved method of preservation due to biological capabilities and phospholipid membrane. This study was completed to determine how liposomes would affect the cryopreservation of boar sperm. Boar semen samples were harvested from four different boars over a period of days. Half of the sperm from each boar was frozen with a liposome extender and the other half was not. The sperm samples were later thawed and tested for viability and motility. Motility testing was analyzed using the CEROS II motility analysis software. Viability testing for the samples was run through two kits on a Guava easyCyte flow cytometer, ViaCount and MitoDamagae, in order to count the cells and determine the viability of the mitochondria, cellular membrane, and cell death. All the data was collected and compared between the treated and control samples. The CEROS II software showed virtually no difference in motility between samples. The ViaCount and MitoDamage software displayed a slight increase in viability in most samples treated with liposomes and no change in percentage of apoptotic cells. The data shows slight improvement in overall sperm viability when frozen with the liposomes. It appears the liposomes did not harm or significantly improve the preservation process.

0546

EVALUATION OF CONSTRUCTED WETLANDS FOR PHYTOREMEDIATION OF SELENIUM-IMPACTED RUNOFF

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Stormwater runoff impacted by selenium (Se) raises concern over potential downstream impacts on aquatic ecosystems. Constructed wetlands are a sustainable, inexpensive, eco-friendly treatment option to improve water quality. This research was conducted to evaluate the application of constructed wetlands to improve water quality of selenium-impacted runoff. The experiment was a 3 X 3 factorial arrangement of treatments nested within a split-split-plot design. Cattail (*Typha angustifolia* L.), duckweed (*Lemna minor* L.), and unplanted (UNP) microcosms were treated with a 30 L solution of 0, 16, and 32 μg Se L^{-1} as selenate. After a six- day retention period, microcosms were "discharged" and flooded again 24 hours later. This was repeated three times. Water samples were collected at 0, 3, and 6 days after application. Plant and soil samples were collected at the end of each retention period. All samples were analyzed for total [Se] by inductively coupled plasma-mass spectrometry. Data were analyzed using repeated measures with PROC GLM α=0.05. On average, CAT and DWD-planted microcosms reduced mean aqueous Se concentrations by 47% compared to 32% in UNP microcosms. Cattail mean plant tissue Se content was less than 450 μg Se kg^{-1} DW during each retention period. In DWD, mean plant tissue Se content significantly increased within each retention period from 1618 to 5365 μg Se kg^{-1} DW. These results suggest CAT remove aqueous Se through phytovolatilization, whereas DWD phytoaccumulates aqueous Se. Given their abundance and efficacy, cattail and duckweed are suitable species for phytoremediation in constructed wetlands supplied with selenate-impacted runoff.

0547

GO ENRICHMENT FOR SIGNIFICANTLY REVERSIBLY OXIDIZED CYSTEINES IN *ARABIDOPSIS THALIANA*

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Modern high throughput screening methods generate big omics data. Analyzing this data manually has become increasingly unreasonable due to its sheer size. Hence, methods such as Gene Ontology (GO) enrichment has become a standard tool in such analysis. Our lab previously developed a computational method identifying cysteines significantly reversibly oxidized. Here, we further extend this computational method with the addition of GO enrichment using the controlled vocabulary from the Gene Ontology Consortium. In addition to testing for statistically significant GO categories, we calculated the log fold enrichment for each significant GO category by comparing its occurrence in the significantly reversibly oxidized cysteines and the entire genome. As an extension to this traditional GO enrichment, we superimposed experimental dynamics. We assigned experimental mean log fold changes (LFC) from cysteines associated with a GO term. Each GO term also has an associated frequency of positive and negative LFC of the cysteines. We applied this method

to significantly oxidized cysteines from *Arabidopsis thaliana* plants infected with *Pseudomonas syringae DC3000 avrrpt2*. The comparison between 8 hours and 8 hour control had GO terms involved in molecular function and were enriched for (among others) unfolded protein binding and protein binding involved in protein folding. Cysteines in these categories had an average LFC which was positive, with a frequency approaching all being oxidized.

0549

MAIZE COB METABOLOMICS: DISCOVERY OF ANTIFUNGAL METABOLITES BY LC-MS^n

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Aspergillus flavus is a pathogenic fungus that causes ear rot of maize (Zea mays L.) and produces a carcinogenic secondary metabolite known as aflatoxin. A. flavus is a chronic problem in food safety as it often infects and poisons maize (both pre- and post- harvest), and accounts for an average loss of $225 million per year in US. Aflatoxin B1 is the most potent carcinogenic mycotoxin known, causing hepatocellular carcinoma, along with many other health problems. Both humans and animals are at risk from ingesting food and feed contaminated with aflatoxin. The goal of our NIFA funded project is to mitigate the loss in maize production due to aflatoxin accumulation while alsoincreasing food safety and sustainability.

While maize silk and kernels contributors to aflatoxin resistance have been widely investigated, maize cob rachis tissue has only received limited attention. β-GUS-tagged A.
flavus bioassays demonstrated A. flavus's ability to spread through the vascular tissue of susceptible maize but is limited inresistant maize. This indicates the rachis tissue's defensive response is critical in limiting the spread of A. flavus in maize.

The objective of this project is to confirm the role of maize cob metabolites in resistance against fungal pathogen, with the specific goals of identification of particular antifungal metabolites using LC-MSn technology. Our initial research has identified several groups of known antifungal metabolites in cob rachis tissue for the first time, with statistical differences found between defense linked metabolites of the resistant and susceptible genotypes.

0550

ASSESSMENT OF CLIMATE CHANGE EFFECTS ON PERFORMANCE OF LEVEES CONSIDERING MULTIPLE FAILURE MODES

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Adaptation to climate change requires a careful evaluation of infrastructure performance under extreme events from different emission or radiative forcing scenarios. This paper presents the results of a site-specific study performed to quantify the effects of extreme precipitation in a changing climate on the performance of an earthen levee considering multiple modes of failure. A fully coupled elasto-plastic finite element model is employed to determine the seepage and stress fields of the levee subjected to extreme precipitations. Non-stationary Intensity-Duration-Frequency (IDF) curves are used to represent future extreme precipitations with 50-year and 100-year return periods in the simulations. The model is used to evaluate the probability of failure of the levee against individual and combined modes of failure, i.e., slope instability, piping, overtopping, and internal erosion. Results are employed to develop a set of three-dimensional fragility surfaces that can be applied for risk analysis and planning purposes. The combined fragility surface includes the collective effect of each mode of failure. The slope instability has the highest impact on the combined fragility surfaces, while the internal erosion has the least effect.

0551

COMPOSTING OF CROSS LAMINATED TIMBER (CLT) SAWDUST

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A three-month study evaluated composting of cross laminated timber (CLT) sawdust amended with 10% and 20% chicken litter. Moisture was provided by rainwater or deionized water depending on the precipitation. The contents in the containers were mixed once or twice a week for aeration. Samples were collected at 0, 45, and 90-day intervals to measure weight loss, moisture content, pH, compost maturity, microbial count, and carbon-to-nitrogen ratio. Results indicated that composted CLT with 20% chicken litter had much higher weight reduction than others at day 45 and 90. Treatments with 10% and 20% chicken litter had a higher initial pH than controls and showed a slow increase near to neutral 7 by day 90. The germination rate of radish seeds to measure the compost maturity showed that composted CLT with 20% chicken litter had significantly higher germination rate than the others at days 45 and 90. A greenhouse study of composted material showed also that the 20% treatment could be used as soil amendment due to its excellent C/N ratio but appears to be unsuitable for container media. Longer composting time is

suggested for CLT sawdust to be cured and used for potting media.

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Category: Psychology and Social Sciences

0436

FOOD INSECURITY AMONG SMALLHOLDER MEN AND WOMEN FARMERS IN RURAL GHANA: HOUSEHOLD HUNGER SCALE RESULTS

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Background: The USAID-funded Feed the Future Soybean Innovation Lab's research in Northern Ghana focuses on improving food security and sustainable agricultural production among smallholder farmers.

Methods: Within a larger survey, we administered the Household Hunger Scale (Ballard et al., 2011) to farmers (*N*=675) in Northern Ghanato explore household-level hunger (HLH). The Scale categorizes HLH in the past 4 weeks as occasional (1-2 times), moderate (3-10 times), or severe (≥11 times) for three Hunger Events (HEs): HE1) No food to eat of any kind in the household due to lack of resources, HE2) Household member(s) went to sleep hungry because there was not enough food, HE3) Household member(s) went a whole day and night without eating because there was not enough food.

Results: For HE1, ~30% reported occasional (19.1%), moderate (11.6%), and severe (2.1%) hunger. For HE2, ~29% reported occasional (16.8%), moderate (11.4%), and severe (2.8%) hunger. For HE3, ~23% reported occasional (11.6%), moderate (10.3%), and severe (2.9%) hunger. Females were more likely to report occasional HLH. Males and females were equally likely to report moderate and severe HLH.

Discussion: Results suggest the Household Hunger Scale is an appropriate measure for cross-cultural use to assess HLH in food-insecure regions.

0447

POST-DISASTER RESPONSE TO THE COMMUNITY FOREST: CHALLENGES AND OPPORTUNITIES

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The community forest offers many diverse benefits to residents, such as pollution mitigation, water quality improvement, and energy savings. However, it can also be a cause for concern during and after major storms due to increased risk for tree part and whole tree failure. Tree hazards impact utility services, transportation access, storm water drainage, and life and property of residents. This project sought to identify and describe the major challenges and opportunities for Mississippi cities regarding post-disaster response to their community tree canopy. The project employed open-ended interview questions with city planners, publics works officials, utility directors, parks directors, arborists, urban foresters, foresters, and other residents who have an interest in community tree care. Overall, attitudes towards the community forest were positive with participants placing high value on urban trees and their benefits. Local utility companies, cleanup crews, and volunteers were generally well-regarded with how well and quickly they handled cleanup and tree planting. Although some municipalities demonstrated plans for replanting after storms, many did not. While natural regeneration was observed in almost every community surveyed, assessment of natural regeneration as an effective means of reestablishing the community forest was mixed. Further, while some of the remaining timber after a storm was salvaged and sold or used for firewood, the majority of it was taken to a landfill, which increases landfill costs and wastes the wood resource. These findings help guide future policy and educational efforts in addressing the community forest, which are expounded upon.

0482

WILLINGNESS TO PAY FOR PRESCRIBED BURNING BY NONINDUSTRIAL PRIVATE FOREST LANDOWNERS

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Prescribed burning is the process of carefully applying fire to forest fuel under definite conditions to meet forest management objectives such as hazardous fuel reduction, forbs and herbaceous plant growth promotions, wildlife habitat improvement, and wildfire suppression cost reduction. It is the most commonly implemented fuel reduction treatment by nonindustrial private forest landowners (NIPF) in Mississippi. Information related to willingness to pay (WTP) for prescribed burning by NIPF landowners will help increase acreage burnt by developing new burning policies, cost-sharing programs, tax incentives, and wildfire insurance policies. This study estimated the mean WTP by NIPF landowners for prescribed burning and determined the factors affecting WTP estimates using a contingent valuation method. A logistic regression model was constructed to determine the relationship between WTP for prescribed burning and landowner socio-economic characteristics. The Delta

method was used to determine the confidence interval of mean WTP. The results indicated that only 26% of the landowners were willing to pay for the implementation of prescribed burning on their forest lands. The primary reason for their unwillingness to implement a prescribed burning was a high payment amount. The mean WTP was $29.00 per acre with a 95% confidence interval of $5.80 to $52.20 per acre. The payment amount and landowner's age were negatively related with WTP, whereas education level and distance from residence to forest were positively related. The study will help in the development of programs that will motivate implementation of prescribed burning to reduce forest fuel and wildfire risks.

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Category: Ecology and Evolutionary Biology

0437

ADAPTATION TO DISHONEST ENVIRONMENTAL SIGNALS: INSIGHTS FROM AN EXPERIMENTAL MICROCOSM

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Global change may alter the fitness of individuals and populations via changes in habitat quality cues. An animal's perception of these quality cues and their ability to adapt to changing cues are critical to population persistence. We examined the influence of perception of resource quality on fitness of fruit flies (Drosophila melanogaster) in an experimental system consisting of dishonest resource signals. Flies were placed on 24 diets varying in nutritional quality, and with non-nutritional quality-modifying additives, in a fully crossed design. Eight generations were grown on every diet in isolation across 4 experimental trials, and fecundity counts were taken at generations 2 and 8 to assess potential adaptation. Fitness generally declined at low nutritional values as expected, though this effect diminished significantly by generation 8. In generation 2, diets with added attractant exhibited higher fecundity counts, and repellants exhibited lower counts; however, the direction of both effects switched by generation 8. These results indicate rapid adaptation to adverse true environmental conditions. Populations also adapted to the presence of a perceptual modifier over the same period-that is, incorrect signals of resource quality ceased to modify behavior within 8 generations of exposure. These results suggest that the rate of generational turnover is critical to population persistence in changing environments. Animal perception and cognition are ecological mechanisms critical to population persistence in changing environments, and to establishment in novel environments (e.g., reintroduction or range expansion), with profound implications for biological invasions, conservation, and management.

0457

EXPERIMENTAL ASSESSMENT OF IN-FIELD AGRONOMIC MANAGEMENT ON NUTRIENT CYCLING AND AVAILABILITY IN OVERLYING WATER IN RICE PRODUCTION SYSTEMS

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Rice is a staple food for more than half of the world's population and has the ability to support more people per unit of land than wheat or corn, however, concerns remain about the sustainability of rice production pertaining to soil and water quality. Conventional rice production can affect nutrient cycling and availability in soils, and subsequently, overlying water quality in flooded rice fields. Using an alternative approach, Low-external-input sustainable agriculture (LEISA), a production activity that optimizes locally available resources, while minimizing fertilizer use, aims to improve soil health while protecting water resources. This study, using soils from different rice cultivation management regimes in the Mississippi Alluvial Valley (MAV), will measure nutrient concentrations (0.5 mg/L and 5 mg/L) in overlying water over time (24, 48 hours and 1 week) to determine soil-water interactions and nutrient availability via a soil-water column experiment. It is hypothesized that overlying water in columns from LEISA rice production systems in the MAV will have improved quality, compared to conventional rice production systems. Results from this study help to identify alternative farming strategies, such as LEISA, that promote conservation of soil and water resources while maximizing profit and minimizing input, fostering more sustainable rice production systems.

0471

HIGH RESOLUTION DUNE GEOMORPHOLOGY TO INFORM CONSERVATION PLANNING IN THE NORTHERN GULF OF MEXICO

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Beach dunes are iconic features within coastal environments, and are essential for the maintenance and resilience of the structure and health of coastal ecosystems. However, despite their significance to coastal systems, dynamics of these three-dimensional landscape features are challenging to understand, particularly across large

geographic extents. Until recently, limitations in data resolution have prevented comprehensive geospatial characterization of dune geomorphology across the Northern Gulf of Mexico (NGOM) coastline, which has limited conservation planning efforts targeting dune systems. Recent coast-wide QL1 and QL2 LIDAR data and associated 1-meter resolution digital elevation models have now made development of an accurate and complete coastal geomorphon possible. Using publically accessible NOAA, USACE, and USGS-sourced high-resolution DEM and LIDAR point clouds, we developed fine-resolution (sub-meter) dune geomorphons in GRASS GIS which allow for assessment of regional variation in dune structure across the NGOM. This allowed for a NGOM-wide analysis of slope, elevation, and other elements associated with individual dune footprints (e.g. crest location, width, etc.). Dune geomorphons will be used in concert with 1-m resolution imagery-based vegetation characterization to develop models of habitat selection in endangered beach mice populations. Additionally, geospatial characterization of dune features provides opportunities for future assessment of Gulf coast dune dynamics over time to inform conservation planning efforts, including evaluation of anthropogenic influences on the coastline, documentation of the natural evolution of dune structure, and identification of sensitive areas for targeted species and ecosystem management.

0496

PREDATION RISH OF DOUBLE-CRESETED CORMORANTS (*Phalacrocorax auritus*) ON COMMERCIAL CATFISH PRODUCTION IN THE MISSISSIPPI DELTA

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Double-crested Cormorants (*Phalacrocorax auritus*) impact United States commercial aquaculture and are considered the greatest avian predators at catfish (*Ictalurus spp.*) aquaculture facilities. Cormorants are especially problematic in western Mississippi, the Delta, where catfish production is concentrated providing ideal wintering and foraging areas. Although cormorant/aquaculture dynamics have been studied in the past, recent changes (e.g., decreased overall hectares in production) in aquaculture practices and regulatory policies merit contemporary research. Therefore, we estimated abundance and distribution of cormorants at their night roosts and assessed diet related to catfish consumption. We used aerial point count surveys flown over night roosts from October through April during two winters, 2016-2018. Following each survey three active night roosts were randomly selected for harvesting cormorants for later necropsy and stomach contents assessment. We completed 25 total surveys and counted 357,850 cormorants (corrected for observer bias). Mean number of cormorants detected per survey, pooled over years, was 14,314 (range 2,964 to 25,624). We collected 730 cormorants from 27 different night roosts across years. Throughout the study catfish comprised 42% of the prey biomass detected with shad (*Dorosoma spp.*) being the other predominate (47%) prey species. Evidence suggests that the area of catfish aquaculture surrounding a night roost within a 30.6 km buffer is an important predictor for a bird's relative amount of catfish consumption. These results will inform wildlife managers about relationships between cormorant night roost locations in the Delta and disproportionate consumption of catfish, aiding techniques to help ameliorate fish losses on aquaculture facilities.

0513

FORAGING ECOLOGY AND DEPREDATION IMPACT OF SCAUP ON COMMERCIAL BAITFISH AND SPORTFISH FARMS IN EASTERN ARKANSAS

Stephen Clements[1], Brian Davis[1], Brian Dorr[2], Luke Roy[3], Katie Hanson-Dorr[2], Anita Kelly[4], Carole Engle[5], Scott Barras[6]

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Research is needed to address the growing concerns of Arkansas' commercial baitfish and sportfish producers regarding the perceived increase in consumption of fish by lesser scaup (*Aythya affinis*) and greater scaup (*Aythya marila*); hereafter, scaup. The goals of our study were to estimate the distribution and abundance of piscivorous waterbirds, including scaup, on bait- and sportfish farms during fall-winters 2016-2017, and compare our contemporary results with unpublished surveys conducted from 2004 to 2005. Additionally, we aimed to estimate the amount of fish consumed by scaup foraging on commercial bait- and sportfish ponds. We surveyed approximately 800 baitfish and sportfish ponds (n = 15 individual farms) in Lonoke and Prairie Counties, Arkansas in winter 2016-2017. Accompanying these surveys, we also collected 294 foraging scaup from ponds. We removed and identified all food items in the gastrointestinal tract above the gizzard

and taxonomically sorted, dried, and weighed each sample. All gizzards were examined for presence or absence of fish parts. We detected fish parts in 2% of scaup examined. A generalized linear mixed model fitted to previous and current survey data showed that scaup abundances were significantly higher on golden shiner ponds than ponds containing fathead minnows, goldfish, or sportfish. Our model indicates a significant decrease in scaup abundances during the contemporary surveys, which we attribute to the mild 2016-2017 winter. Our data will be vital in estimating the economic impact of fish loss to scaup foraging in these Arkansas ponds, and reveal potential management strategies to reduce fish predation by scaup.

0522

SPATIOTEMPORAL AND SEXUAL VARIATIONS IN SPACING BEHAVIORS OF AMERICAN WHITE PELICANS IN THE ANNUAL CYCLE

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The annual cycle of migratory birds consists of nesting, wintering, and migration seasons. We aimed to understand spatiotemporal and sexual variations in spacing behaviors of American white pelicans (Pelecanus erythrorhynchos) among the Northern, Southern Gulf of Mexico and the Great Plains. We attached GPS transmitters to 20 pelicans captured at Chase Lake, North Dakota, and 40 birds at the wintering grounds of Alabama, Mississippi, and Louisiana from 2002 to 2016. We compared hourly movement distances and home ranges among seasons (spring and autumn migration, nesting, and wintering periods), wintering grounds (the Northern and Southern Gulf of Mexico), and sexes. During nesting seasons, male pelicans moved faster than females, and had larger home ranges than during wintering seasons. Males wintering in the Northern Gulf of Mexico had larger home ranges and greater movement speeds than at south, supporting McNab's energy constraint hypothesis. During migration seasons, pelicans moved faster in spring than autumn migration, which was especially pronounced in populations wintering at south. Home ranges of all seasons became smaller from 2002 to 2016. Migratory birds may change their spacing behaviors and movement patterns in response to variations in climate, resource availability and bird physiology among seasonal habitats and over time.

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Category: Cellular, Molecular and Dev. Biology

0442

OCCIDIOFUNGIN INHIBITS FILAMENTATION IN CANDIDA ALBICANS THROUGH THE CEK1 MAPK SIGNALING PATHWAY

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Candida albicans is a polymorphic fungus that grows as budding yeast and true hypha. The transition from yeast to hyphae is considered a major virulence factor and makes *Candida* infections a challenge to treat. In *C. albicans*, the morphological switching is controlled through a MAPK signaling cascade. The MAPK, Cek1p, is a component of this pathway shown to be involved in starvation specific hyphal development. Occidiofungin is an antifungal drug shown to be effective against *Candida* species. Prior work has shown that occidiofungin prevents *C. albicans* from forming hyphae. Based on these findings, we hypothesize that occidiofungin may function to disrupt the signaling events associated with morphological switching. The aim of this study is to determine the impact of occidiofungin on MAPK signaling as measured by changes in Cek1 MAPK phosphorylation. To this end, occidiofungin was added to cells prior to hyphal switching and samples were collected at defined time points for analysis of Cek1p MAPK activation by western blot. Normalizing Cek1p phosphorylation with GAPDH, the activation of Cek1p was not completely inhibited with occidiofungin exposure. To complement these findings, a morphological study of occidiofungin-exposed cells was performed using light microscopy. As previously observed, no hyphae were found. This inhibition of filament formation, coupled with the reduced levels of Cek1 activation, suggest that occidiofungin exposure negatively impacts the Cek1 MAPK signaling cascade. Whether occidiofungin targets a component of this pathway or is indirectly impacted by occidiofungin activity, remains to be determined.

0444

UTILIZATION OF SCLEROSTIN AS A POTENTIAL THERAPEUTIC TARGET FOR VASCULAR CALCIFICATION

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Cardiovascular disease causes one third of deaths within the United States population, with patients suffering from diabetes and chronic kidney disease at exceptionally high risks. Vascular calcification (VC) is a critical component of cardiovascular disease. Once recognized as a passive process induced by elevated calcium-phosphate

interactions, VC is now regarded as an active, cell-mediated process induced by competition among stimulatory calcification and inhibitory mineralization factors. These factors include elevated levels of oxidative stress, phosphate, calcium, parathyroid hormone, cholesterol, and glucose. Recent investigations have indicated that as VC increases, bone density and mass decrease. Sclerostin has been identified as an osteocyte-derived glycoprotein capable of inhibiting bone formation, and recent studies have explored sclerostin antibodies as therapeutic agents for osteoporosis. We developed an *in vitro* calcification model that induces osteogenic differentiation within human vascular smooth muscle cells (hVSMC) to investigate the Wnt/B-catenin signaling pathway and to utilize sclerostin as a potent antagonist of the pathway. Within the model, hVSMC were cultured and treated with sclerostin. hVSMC exposed to calcification and sclerostin treatment exhibited a two-fold downregulation of RUNX2, a transcription factor involved in osteogenic differentiation, providing validation that sclerostin is capable of preventing the phenotypic switch within the vasculature. Additionally, treated cells demonstrated upregulation of the protein a-smooth muscle actin, showing that they retained their natural phenotype. In conclusion, sclerostin is capable of preventing the phenotypic switch within the vasculature. Future quantitative and qualitative time course studies will investigate sclerostin as a potential therapeutic agent for VC.

0445

INVESTIGATING THE EFFECTS OF PH AND SUBSTRATE STIFFNESS ON VASCULAR CALCIFICATION

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Cardiovascular diseases are the leading cause of death globally. Vascular calcification (VC), which is a consequence of cardiovascular disease, is characterized by calcium and phosphate minerals being deposited along the vascular walls. These minerals that are deposited along the vascular walls are also known as hydroxyapatite crystals, which can also be found in bones. Elevated calcium levels promote phenotypic changes in native cells, causing stiffness. Although there are many factors that can affect VC, substrate mechanics are significant in determining how cells calcify. There has been evidence to show that cells are able to recognize the mechanical aspects of the environment in which they are growing in, then grow accordingly. In this study, vascular smooth muscle cells will be cultured in normal and calcifying media to determine the effect of surface stiffness on the calcification process. By taking the pH of cells after 24 hours, 3 days, and 7 days, the health and viability of cells will be tested to determine which surface is more conducive to cell growth and proliferation. The MTT assay will also be done at all three time points to determine cell count. By understanding the relationship between pH and calcification, we can have more knowledge to design future studies.

0446

ALGINATE HYDROGELS AS AN INJECTABLE CELL DELIVERY SYSTEM

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Vascular calcification is an indicator of future heart disease and occurs primarily in patients with chronic kidney disease. A breakthrough in this field was the realization that the process of arterial calcification is similar to osteogenesis. This discovery led to the idea of using osteoclasts as a mechanism of reversing calcification just as osteoclasts reverse bone formation. This solution would require a degradable cell delivery mechanism such as a hydrogel to transport the osteoclasts to sites of calcification. The proposed delivery system is alginate hydrogel microbeads which could encapsulate osteoclast cells and then be directly injected into sites of calcification. The primary components of this study are oxidation of alginate to more accurately predict degradation in vivo, crosslinking of alginate and microbead formation, and cell encapsulation in the microbeads. The results of the study indicated that oxidation allows the microbeads to be degraded at body temperature, and that cells can be successfully and viably encapsulated in the crosslinked alginate beads. Further studies include using microbeads in a calcification model to determine whether encapsulated osteoclasts can successfully inhibit calcification. The reversal of calcification plays a crucial role in the prevention and treatment of heart disease, and a reversal mechanism would be large advancement in the care of the cardiac system.

0467

INVESTIGATING THE LUNG TRANSCRIPTOME OF HORSES WITH PASTURE ASTHMA TO IDENTIFY MEDIATORS OF AIRWAY HYPER-RESPONSIVENESS

Kensey Thomas[1], Christa Frodella[1], Shawndasia Collins[1], Alison Eddy[1], Cathleen Mochal[1], Andrew Claude[2], Jacquelyn Bowser[3], Cyprianna Swiderski[1]
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Human and equine asthma are similar diseases characterized by three diagnostic criteria: (1) reversible airway obstruction, (2) non-specific airway hyper-responsiveness (AHR), and (3) chronic airway inflammation. Asthma mortality and indicators of severe

human asthma are disproportionately increased in Mississippi, a state in which a pasture-associated form of severe asthma is also identified in horses. Gaining further insight into the mechanisms which make the airways hyper-responsive to inhaled stimuli in horses with equine pasture asthma (EPA) will not only help horses, but also humans. To investigate the mechanisms that result in airway hyper-responsiveness, we characterize differences in gene expression in lung tissue from EPA horses during an asthma attack relative to gene expression in lung tissue from non-diseased horses living in the same environment. To accomplish this, video assisted thorascopic surgery was used to biopsy lung tissue during clinical exacerbation and remission of asthma in EPA (n=6) affected horses. Six healthy controls horses were sampled at the same time points. Genes that were differentially expressed in association with disease were identified by short read RNA sequencing using CLC Genomics Workbench (Qiagen, Inc) and analyzed for their potential relevance to factors, including increases in airway smooth muscle, that are known to contribute to airway hyper-responsiveness.

0480

THREE-DIMENSIONAL SCAFFOLD FOR SMOOTH MUSCLE CELL VIABILITY

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Vascular calcification is recognized as a pathobiological process sharing many features with embryonic bone formation. Moreover, there are two types of calcification that take place in blood vessels. One is intimal calcification that occurs with the atherosclerotic plaque associated with cells and collagen. The other type is medial, and it is associated with elastin. Vascular calcification is related to vascular smooth muscle cells (VSMCs) because they tend to differentiate into osteoblast-like cells depending on the different pathological and physiological conditions. Because arteries are composed primarily of collagen, modeling calcification on a collagen scaffold is thought to be more representative for in vitro studies. Collagen-elastin scaffoldings were discovered to be appealing biomaterial models due to their mechanical properties and biocompatibility. In this study, we attempted to determine whether these collagen-elastin scaffolds could be used for cell culture environments. In addition, the collagen-elastin scaffold was constructed and VSMCs were seeded on the surfaceof the scaffold. Cell viability was tested to confirm the scaffold's ability to be used as a biocompatible in vitro vascular model for vascular calcification studies. In future research, we aim to determine whether these scaffolds can be calcified for further research studies.

0485

ALGINATE HYDROGELS AS AN INJECTABLE CELL DELIVERY SYSTEM

Virginia Mullins, C. LaShan Simpson
Mississippi State University, Starkville, MS, USA

Vascular calcification is an indicator of future heart disease and occurs primarily in patients with chronic kidney disease. A breakthrough in this field was the realization that the process of arterial calcification is similar to osteogenesis. This discovery led to the idea of using osteoclasts as a mechanism of reversing calcification just as osteoclasts reverse bone formation. This solution would require a degradable cell delivery mechanism such as a hydrogel to transport the osteoclasts to sites of calcification. The proposed delivery system is alginate hydrogel microbeads which could encapsulate osteoclast cells and then be directly injected into sites of calcification. The primary components of this study are oxidation of alginate to more accurately predict degradation in vivo, crosslinking of alginate and microbead formation, and cell encapsulation in the microbeads. The results of the study indicated that oxidation allows the microbeads to be degraded at body temperature, and that cells can be successfully and viably encapsulated in the crosslinked alginate beads. Further studies include using microbeads in a calcification model to determine whether encapsulated osteoclasts can successfully inhibit calcification. The reversal of calcification plays a crucial role in the prevention and treatment of heart disease, and a reversal mechanism would be large advancement in the care of the cardiac system.

0504

INHIBITION OF CES1-CATALYZED PROSTAGLANDIN D2 GLYCERYL ESTER (PGD2-G) HYDROLYSIS IN HUMAN THP1 MONOCYTES TO REGULATE ANTI-INFLAMMATORY RESPONSES

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Monocytic cells in human blood have important roles in host defense and contain the enzyme carboxylesterase 1 (CES1). CES1 plays a critical role in prostaglandin glycerol ester (PG-Gs) metabolism to glycerol and prostaglandins. In our study, the goal was to determine whether an anti-inflammatory PG-G, PGD2-G, is catabolized by CES1 into PGD2 and glycerol, and to determine the degree to which the PGD2 production could be inhibited. This PGD2 buildup could be harmful as prostaglandins have been shown to play a role in the body's inflammatory responses. A human monocytic cell line

(THP1 cells) was treated with increasing amounts of small-molecule inhibitors that block CES1 activity [chlorpyrifos oxon (CPO), WWL229, and WWL113] followed by incubation with PGD2-G (10 uM). Organic solvent extracts of the treated cells were prepared and analyzed by LC-MS/MS to assess PGD2 levels. Also, THP1 monocytes with normal CES1 expression (control cells) and knocked down CES1 expression (CES1KD cells) were employed to show CES1's role in PGD2-G metabolism. It was hypothesized that PGD2-G could be hydrolyzed by CES1 and the production of PGD2 in the cells would decrease in an inhibitor concentration-dependent manner. We found that CES1 has a prominent role in PGD2-G hydrolysis in THP1 cells, accounting for about 50% of its hydrolytic metabolism, and PGD2 levels progressively decreased as the inhibitor concentration increased. The most potent inhibitor assessed was CPO and WWL229 was the least effective. These results suggest that anti-inflammatory effects caused by PGD2-G can be augmented by modulating CES1 activity with specific inhibitors.

0511

BIOCHEMICAL EFFECTS OF ORAL CHLORPYRIFOS IN LUNGS OF NEONATAL AND ADULT MICE

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Chlorpyrifos (CPF) is an organophosphate (OP) pesticide known to exhibit toxicity via inhibition of acetylcholinesterase (AChE) in the nervous system. We previously showed that endocannabinoid (eCB) metabolizing enzymes were even more sensitive to inhibition by OP pesticides than AChE in neonatal rats, leading to increased levels of eCBs in brain. Because eCBs are known to have immunosuppressive effects, we are investigating a link between eCB metabolism and immunity in adults and neonates exposed to CPF. We hypothesized that neonatal mice would be more sensitive than adult mice to the effects of CPF. Adult and neonatal mice (PND 4-10) were treated with CPF (2.5 mg/kg oral) or vehicle daily for 7 days. Tissues were harvested 4 hr after final treatment. Anandamide (AEA) and 2-arachidonoylglycerol (2-AG) hydrolysis activities in spleen and brain were not different between vehicle and CPF, but lung 2-AG hydrolytic activity was decreased by CPF in adults. Lung microsomes from both age groups demonstrated marked inhibition of carboxylesterase (Ces) activity, one of the known eCB metabolizing enzymes. Lung Ces activity in neonates was more sensitive to CPF than adults. Activity-based protein-profiling (ABPP) and immunoblotting of lung microsomes confirmed that Ces1 was present in both age groups, and the activity was inhibited by CPF. ABPP-mass spectrometry of neonatal mouse lung microsomes identified 31 serine hydrolases, and Ces1d (the murine orthologue of human CES1, abundant in human macrophages) was selectively inactivated by CPF. Further studies will explore the role of inhibition of Ces1d by CPF in pulmonary inflammation.

0521

IN-VIVO QUANTUM DOT HORMONE TRACKING

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In male amphibians, arginine vasotocin (AVT) is both a reproductive and osmoregulatory hormone. Assisted reproductive studies have used AVT in the past in order to stimulate reproductive behaviors. However, concern over its effects on water absorption and kidney function require further study. To determine the targeted organs of exogenous AVT, male Fowler's toads were administered AVT conjugated to quantum dot nanoparticles (QDot 655) as a method of tracking quantum dot nanoparticle movement through the toad's body. Live toads were administered a 5nm dosage of AVT-QDots or unconjugated QDots intraperitoneally. The In-Vivo Imaging System (IVIS) was used to observe the movement of QDots at various time intervals. Fluorescent signals from conjugated nanoparticles remained localized near the point of injection, while the unconjugated QDots diffused further over the body cavity. Following IVIS imaging, the testes and kidneys were removed from the subjects in order to confirm the presence and aggregation of AVT-QDots compared to unconjugated QDots in these organs using a fluorescence microscope. This study demonstrates the affinity for QDots to receptors on the kidneys and testes of male toads, and further advances the understanding of nanotechnology as a tool for in-vivo imaging.

0528

POLYAMINES, THE PNEUMOCOCCUS, AND PYTHON PROGRAMMING

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Streptococcus pneumoniae bacteria naturally inhabit the human nasopharynx but occasionally cause severe illness. Current vaccines only target a fraction of the 94 serotypes. Polyamines interact with DNA, RNA, and proteins to regulate cellular processes and impact virulence in

pathogenic bacteria. We have shown previously that impaired polyamine metabolism affects capsule synthesis and carbohydrate metabolism. We used in vitro growth assays to determine the effect of impaired polyamine metabolism on pneumococcal growth in chemically defined medium with different carbohydrate sources. A wild type S. pneumoniae strain and strains deficient in polyamine transport (ΔpotABCD) and biosynthesis (ΔspeE, ΔcadA) were used to study the impact and connections between polyamine regulation and carbon source. We also generated custom Python scripts and used genomic features such as Shine-Dalgarno sequences, inefficient start codons, and nonsense codons to identify pneumococcal genes that could undergo translational regulation by polyamines. Our results show a difference in the growth of impaired polyamine transport and synthesis strains when using different carbohydrates as a carbon source. Since the host environmental niche of S. pneumoniae is incredibly diverse and available carbon sources vary widely, these results could help our understanding of pneumococcal adaptation to the host in a polyamine dependent manner.

0529

SYNTHESIS OF VARIOUS SPACERS AND DRUGS FOR CONJUGATION TO ELPs

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ELPs (Elastin-like Polypeptides) are synthetic biopolymers that have unique properties. They are known to undergo liquid-liquid phase separation reversibly above a concentration-dependent transition temperature. Thus they are thermo-responsive and can be equipped with cell-penetrating peptides and loaded with other molecules via cysteine-maleimide crosslinking. Consequently, compounds such as cancer drugs like doxorubicin, can be delivered with ELPs by hyperthermia to target cancer cells. The transition-temperature is influenced by the conjugated drug and this study aims to investigate the effect of various parameters on the thermodynamic functions responsible for the phase separation. Various amino acids are converted into their maleimides and p-nitroaniline amides. p-Nitroaniline absorbs at 365 nm as a free amine, while the amide absorbs at 325 nm. The conjugation to ELP is determined by the ratio of the 280 nm and 325 nm absorptions.

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0533

NANOPARTICLE-BASED APPROACH TO GROWTH FACTOR IMMOBILIZATION ON OSTEOCHONDRAL XENOGRAFTS

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Current methods to treat articular cartilage lesions include osteochondral autografts and fresh allografts, each of which has drawbacks related to availability. A porcine osteochondral xenograft is a viable alternative for immediately restoring functional hyaline cartilage to a joint's surface. We speculate that localized delivery of appropriate growth factors could enhance xenograft performance through stimulation of cell migration, differentiation, and extracellular matrix synthesis. The purpose of this study was to explore a method of immobilizing one or more growth factors onto a porcine osteochondral xenograft for sustained delivery in vivo. Polylysine-heparin nanoparticles were produced and loaded with basic fibroblast growth factor (bFGF) following a previously published method. Transmission electron microscopy verified the nanoparticle composition, and particle size was analyzed by dynamic light scattering and was found to range from 55nm to 90nm, with an average of 66nm. Loading and delivery of active bFGF were confirmed by proliferation of primary porcine chondrocytes in vitro. Cells in each well of a 24-well plate were exposed to nanoparticles carrying approximately 150ng of bFGF. After 6 days, cell proliferation had increased by 49±15% compared to controls. A method was then devised to immobilize nanoparticles on an osteochondral xenograft by assembling multiple layers of type I collagen and nanoparticles, which bind to collagen through electrostatic interactions. Confocal laser scanning microscopy confirmed uniform distribution of nanoparticles across the entire surface of an osteochondral xenograft. The results appear to demonstrate a promising layer-by-layer assembly method for coating growth factor-laden nanoparticles onto an osteochondral xenograft.

0538

MITIGATION OF BONE INFECTION WITH BACTERIOPHAGE THERAPY

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Osteomyelitis, or bone infection, afflicts thousands of people in the United States annually. Some of these complications are attributed to the rise of antibiotic

resistant *Staphylococcus aureus (S. aureus)* strains, which are the primary cause of osteomyelitis. Thus, it is necessary to formulate novel therapeutics to overcome this hurdle. Bacteriophage viruses are a promising solution to this problem, as they present little opportunity for bacterium to develop resistance to, while maintaining high specificity, biocompatibility, and antimicrobial activity. Within this study, our objectives were to: (i) utilize the CRISPR-Cas9 system to increase the bactericidal activity of bacteriophage (φ Cas9), (ii)develop a rat implant model of osteomyelitis to evaluate φCas9, and (iii) track the progression and subsequent regression of infection, through the use of green fluorescent protein (GFP), which was chromosomally integrated into our *S.aureus* strain (ATCC 6538). This fluorescent bacteria was visualized *in vitro* using the Cytation5 system, and *in vivo* using an In Vivo Fluorescent System (IVIS). *In vitro* Cytation5 images were used to determine optimal therapeutic doses in the rat model. IVIS allowed us to track infection within the rat over time. To further evaluate our therapeutic excised femurs, screws, and soft tissues were homogenized and plated for bacterial counting. To characterize osteomyelitis, histology was performed. Although this is an on-going study, we have we have: confirmed the superiority of the φ Cas9 system to available antibiotics *in vitro,* and have successfully developed our osteomyelitis model with histological and radiological evidence.

0543

IMPACT OF IMPAIRED POLYAMINE TRANSPORT AND SYNTHESIS ON PNEUMOCOCCAL GROWTH UNDER pH STRESS

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Streptococcus pneumoniae, a gram-positive bacterium and a commensal of human nasopharynx can cause invasive infections such as pneumonia, meningitis and sepsis, and poses a significant risk to human health. The available vaccines that target pneumococcal capsule do not cover all serotypes which complicates strategies for limiting pneumococcal infections. Polyamines, small cationic molecules present in both eukaryotes and prokaryotes, provide pleiotropic means of survival for cells combating low pH stress. Therefore, any impairment in the *de novo* synthesis pathways or transport of polyamines like *putrescine*, *spermidine*, and *cadaverine* can impact the survival of the organism. To better understand the impact of impaired polyamine synthesis (*cadA, speE)* and transport (*potABCD*) on pneumococcal response to pH stress, growth curves of wildtype strain (TIGR4), and isogenic deletion strains *potABCD*, *cadA* and *speE* were generated in culture medium at different pH. Growth kinetics of all strains were analyzed by *GrowthRates 2.1* software. Our results show that growth of polyamine metabolism impaired strains was affected by low pH compared to TIGR4. These observations indicate that polyamines modulate acid resistance mechanisms in pneumococci. We will analyze the expression of genes involved in acid tolerance in pneumococci by qRT-PCR, to identify specific acid tolerance mechanisms in *S. pneumoniae* that are regulated by polyamines.

0548

TRANSCRIPTOMIC EVIDENCE OF SALIVARY PROTEINS FROM CIMEX LECTULARIUS AS THE CAUSATIVE AGENTS OF CIMICOSIS

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Cimex lectularius, the bed bug, was nearly eradicated in the developed world shortly after World War II using DDT and other pesticides. A recent resurgence of bedbug infestations in urban areas of developed countries has caused concern among researchers. Although C. lectularius is not known to transmit pathogens to humans, they do elicit a type I hypersensitivity reaction known as cimicosis. Cimex salivary proteins, including nitrophorin, have been linked to cimicosis, but the mechanism is still unknown. Using an Illumina-based RNA-seq analysis we characterized the differentially expressed transcripts of the salivary glands of C. lectularius. This data offers insight into the major proteins expressed in the salivary glands of bed bugs and identifies targets for potential knock down screening. Preliminary results indicate high silencing efficiency of salivary nitrophorin using double-stranded RNA. We hope to develop a knock down screening assay to shed light on the immunological connection between Cimex salivary proteins and cimicosis.

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Category: Zoology and Entomology

0452

EFFECTS OF AGING ON IMMUNE GENE REGULATION IN *AEDES AEGYPTI*

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Aedes aegypti is a mosquito that vectors several viruses of public health significance, including Chikungunya virus, Mayaro virus, Yellow Fever virus, and Dengue virus, among others. Identified by white markings on its legs and a lyre on the upper surface of the thorax, *A. aegypti* is found in tropical and temperate regions alike throughout the world. Only the female mosquito takes a blood meal, which

is necessary for laying eggs. Few studies have been published on accurately aging *A. aegypti*, fewer still on accurately aging mosquitoes caught in the wild. These studies have previously relied on morphological techniques as well as next generation sequencing based methods. These studies have suggested that immune cells and general immune system function changes with some predictability as mosquitoes mature. The goal of this ongoing study is to obtain accurate data with which to age-grade mosquitoes in the wild, with a starting point of studying immune genes of laboratory reared mosquitoes. The study presented observes changes of eight immune genes in *A. aegypti* as the population ages. Two separate groups of mosquitoes were reared under standard laboratory conditions, with one group having a blood meal at day 5 of the rearing sequence. All immune genes were measured using SYBR green qRT-PCR. Several genes of specific interest include VIR-1, PIWI4, and PPO1, which all change in variable amounts as the mosquitoes age. Specifically, PIWI4 increases throughout the experiment in the blood-fed population. Additional results will be presented.

0461

WHY DO DOGFACE BUTTERFLIES HAVE PINK WINGS? A TEST OF ADAPTIVE HEAT TRANSFER IN *ZERENE CESONIA*

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A major aspect to understanding how development shapes biological diversity is studying phenotypic plasticity. Phenotypic plasticity, the ability to develop multiple phenotypes in response to differing environmental conditions, can be integral in the survival, maintenance, or diversification of species. To better understand the role plasticity plays in generating biological variation an investigation into the dynamic interplay between the genetic, environmental, and developmental factors responsible for generating and maintaining plasticity within a population is required. Here, we investigate how phenotypic plasticity in butterfly wing color patterns may impact body temperature. In pierid butterflies, plasticity in wing melanization has been shown to influence thermo-regulation and fitness of individuals, with darker colored individuals being able to fly longer, mate more and oviposit more, than lighter individuals when temperatures are low. We have collected *Zerene cesonia* butterflies that vary in their amount of pink pigmentation due to changes in photoperiod and temperature. Zernee cesonia is a pierid butterfly that is typically bright yellow with dark black melanic patterns along the wing edges. The number of individuals with pink wings and the amount of pink of the wings increases in Mississippi populations in late Fall and early Spring. Here, we assay the rate of heat transfer for differently colored *Z. cesonia* to test the hypothesis that the darker pink individuals warm faster than more lightly colored (less pink) butterflies.

0514

TESTICULAR ULTRASOUND IMAGING AND ASSISTED REPRODUCTIVE TECHNOLOGY IN A SEMI-AQUATIC SPECIES

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Ultrasound imaging is a rapid, non-invasive tool to determine the sex in species lacking reliable dimorphic sexual characteristics, such as the Eastern tiger salamander (*Ambystoma tigrinum*), and monitor the effects of hormonal treatment to induce spermiation. While egg production in females is easily visualized with ultrasound technology, methods for evaluating testes and sperm production need further exploration. In this study, male tiger salamanders (n=7) were treated with a primer dose of 0.025µg/g-body weight luteinizing hormone releasing hormone (LHRH) 24hrs before a spermiation dose of 0.1µg/g-body weight LHRH. Sperm was then collected over 48hrs beginning after 1hr. Samples were analyzed by hemocytometer for concentration, percent total motility, progressive motility, non-progressive motility, and spermatozoa with abnormal morphology. Sperm was produced in 57% of the treated animals. Serial ultrasound images of the testes were captured prior to each treatment and post-sperm collection for comparison of semen production. No difference was found in the pre-treatment ultrasounds between sperm producers and non-producers. However, testes appear to increase in size with treatment and decrease with collection of sperm in individual sperm producers. This study is one of the first to explore monitoring spermatogenesis through ultrasound in salamanders.

0536

THE IMPACT OF DIETARY ARGININE ON SEMINAL PLASMA PROTEOME OF BOAR

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A common issue when using frozen sperm samples to inseminate livestock is the quality and viability of the sperm sample. Arginine is known for its positive effect on sperm quality and viability. Seminal fluid is the liquid component of semen that promotes the viability of sperm. In this experiment, we observed how dietary

arginine effects expressed proteins in boar seminal fluid. To observe the impact of an arginine diet, ten boars were divided into two groups, a control and treatment group, subjected to either a regular boar feed or arginine supplement feed. After 6 weeks of treatment, sperm samples from each boar are obtained and centrifuged to cryogenically freeze the seminal fluid. Samples were thawed then dissolved in 2DE lysis sample buffers and protein quantifications were performed using Bradford analysis. Three hundred µg of proteins were loaded onto Iso-Electro Focusing (IEF) strips (pI 3-10) and IEF were performed. Each IEF strip was loaded in 4-20% gradient gel. After electrophoresis, the gels were stained with Coomassie R 250 solution and the gels were imaged to compare control and treatment samples by PDQUEST software. Statistics were performed by Student's *t*-test ($P<0.05$). The analysis indicated that eight proteins were significantly expressed compared to the control. This allows us to see that the arginine has a direct impact on protein production in seminal fluid that may play important roles in seminal viability and mortality. Differentially expressed proteins will be identified in the near future. Work wa supported by USDA-ARS Biophotonics Initiative #58-6402-3-018.

0542

RESPONSES OF REPRODUCTIVE AND NON-REPRODUCTIVE MALE *AMBYSTOMA TIGRINUM* TO FEMALE PHEROMONES

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Male plethodontid salamanders release reproductive pheromones to attract a female; however, it is unknown if female salamanders release reproductive pheromones. Furthermore, other classes of salamanders, such as the ambystomids, have not been studied for their potential to communicate through reproductive pheromones. The current study analyzes male behavior in response to female pheromone water (FPW) in *A. tigrinum*. Twelve sets of reproductive and three sets of non-reproductive *A. tigrinum* male-female pairs were analyzed. FPW was created by soaking a female in water for pheromone deposition. Males were simultaneously exposed to FPW and control water samples. For thirty minutes, male sexual behaviors such as snout-raising, approaching FPW, or coming in contact with FPW were documented on an ethogram. Reproductive males were more responsive toward FPW compared to nonreproductive males. On average, reproductive males were 53% more responsive to FPW than control water, while non-reproductive males were only 42% responsive to FPW compared to control. These data suggest that females deposit pheromone cues in water and that reproductively active males are more responsive than non-reproductively active males.

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CATEGORY: CHEMISTRY AND CHEMICAL ENG.

0466

Phenoxazine Polymers for Biosensor Applications

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Phenoxazine is a conjugated fused heterocyclic compound commonly found in dyes, naturally occurring antibiotics and anti-cancer agents. It's excellent photophysical and electrochemical properties are a result of its conjugation of electrons. These properties of phenoxazine make it suitable for biosensor applications. Biosensors must be capable of transmitting chemical signals through optical or electrical activities. Our group has been interested in developing biosensors for a variety of analytes. In this presentation we describe our efforts towards a selective biosensor capable of detecting low to trace concentration of hydrogen peroxide. Hydrogen peroxide play an important biological role in medicine and the human body, which is not only a toxic waste product in the cellular systems but also a major player in the redox signaling pathway. The phenoxazine-based polymer was synthesized as a step growth polymerization with p-phenylenediamine as the co-monomer via a Buchwald/Hartwig reaction. The diamine co-monomer can be varied to allow for the fine tuning of polymer's optoelectrical properties and stability. We will describe our synthetic approach, characterization of the small molecules and polymer, and the optoelectrical properties of the polymer.

0469

PROTECTIVE ACTION OF SEMI-FLUORINATED PERFLUOROCYCLOBUTYL POLYMER COATINGS AGAINST CORROSION OF MILD STEEL

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Among the many organic coatings currently employed for metal protection against corrosive environments, fluoropolymers stand out to be one of the high performance coatings with outstanding chemical resistance, thermal stability, mechanical and non-stick properties, and very low surface energy, all of which are due to the high-strength chemical bond between carbon and fluorine. Polymers with partially fluorinated blocks have shown moisture resistance, good dielectric properties, and stability towards thermal-oxidative processes without

undue sacrifices and even improving the processability. In this study, our efforts have concentrated on the utilization of perfluorocyclobutane (PFCB) polyaryl ethers as coatings and demonstration, for the very first time, of their potential resistance against corrosion. PFCBs are a distinct class of semi-fluorinated polymers which are based on thermal cyclopolymerization of aromatic trifluorovinyl ethers (TFVE). They combine the flexibility and thermal stability of aromatic ethers with the strong fluorocarbon bonds. Electrochemical measurements via electrochemical impedance spectroscopy (EIS) and potentiodynamic scans reveal that the PFCB coatings display barrier properties against corrosion attack such that the extent of protection is tantamount to that of a commercial polyvinylidene difluoride (PVDF) coating. The coatings also displayed excellent adhesion to the metal surface and non-stick property comparable to that of the PVDF. Combined with high thermal and good mechanical surface property, PFCBs could potentially be promising corrosion resistant coatings which could offer usefulness in marine applications and oil and gas industries.

0477

CHROMIUM ION REMOVAL FROM AQUEOUS MEDIA BY ALUMINUM AND MAGNESIUM IMPREGNATED BIOCHAR

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Heavy metal contamination of water bodies by anthropogenic activities is inevitable. Therefore, the development of a cost effective and efficient treatment method is immensely important. Biochar is a promising candidate for the removal of heavy metal contaminants and has received great attention in the scientific community due to its inherent low cost of production and high absorption capacity. Douglas fir biochar (DFBC) produced from fast pyrolysis was impregnated with 5% aluminum sulfate and magnesium chloride. The resulting biochar was characterized by point of zero charge, thermogravimetric analysis, scanning electron microscopy, and transmission electron microscopy. The BET surface area reduced from 535 m2/mg to 316 m2/mg following the metal ion loading. Energy Dispersive X-ray spectroscopy provided evidence for the facile impregnation of Al and Mg into the biochar. Batch sorption investigation of chromium solution on Al/Mg biochar was carried out at pH values ranging from 2 to 10 while the adsorbate concentration varied from 5 to 300 mg/L. The sorption of chromium was monitored by UV-visible spectroscopy at 370 nm. The effect of temperature on sorption was studied at 25, 35, 45 and 550C and adsorption isotherms were analyzed at different temperatures, ranging from 25-55 0C using Langmuir, Freundlich, Redlich-Peterson, Toth, and Sips isotherm models. Langmuir adsorption isotherms give a maximum adsorption capacity of 66 mg/g at pH 6.5 and at 450C. It can be concluded that Al/Mg Douglas fir biochar is a more effective adsorbent for chromium ion removal compared to untreated Douglas fir biochar.

0479

REACTIVE SILVER ADSORPTION ONTO GOLD

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The spontaneous deposition of Ag+ onto gold nanoparticles (AuNPs) and monolayer-protected gold clusters mainly occur through AuNP-facilitated under-potential reduction or by anti-galvanic deposition in which the gold reduces Ag+ into metallic Ag(0). Reported herein is the spontaneous reactive Ag+ adsorption onto gold substrates that include both as-synthesized and butanethiol-functionalized citrate- and NaBH4-reduced AuNPs, commercial high-purity gold foil, and gold film sputter-coated onto silicon. The silver interaction with the organothiol-functionalized AuNPs has a significant effect on the structure, conformation, and stability of the organothiols on AuNPs. It converts butanethiol (BuT) from a disordered mixed trans and gauche conformers into a highly ordered trans conformer. The Ag+ induced BuT ordering is a highly cooperative process that occurs only when BuT is densely packed on AuNPs and completely reacted with Ag+. Mechanically, the Ag+ adsorption on AuNPs most likely proceeds by reacting with molecules pre-adsorbed on the AuNP surfaces or chemical species in the solutions. This work provides the first direct evidence that Ag+ can disrupt the Au-S binding and enhance the mobility of the organothiols on AuNPs. Equally importantly, a series of experimental evidence revealed that the adsorbed silver species most likely are silver salt or oxide in which silver remain as cationic, but not as atomic silver as reported in the earlier works. This insight and methodology presented in this work are important for studying interfacial interactions of metallic species with gold and for post-preparation modulation of the organothiol structure and conformation on AuNP surfaces.

0489

COLORIMETRIC SCREENING LIGAND AND GOLD NANOPARTICLE INTERACTIONS

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Understanding the ligand interaction with gold nanoparticles (AuNPs) is important for biosensing, gold catalytic activity, drug synthesis and delivery. Despite the

availability of many instrument-based methods to monitor the ligand interactions such as; UV-vis, fluorescence, surface enhanced Raman spectroscopy (SERS), and dynamic light scattering, there is lack of rapid, high-throughput non-instrument-based screening method. Hence, this method enables us to minimize the cost of instrumentation and the expertise needed for handling and analyzing the data, making it highly facile and cost-effective technique. Potassium cyanide is used as the probe to screen the ligand interactions. Cyanide-induced gold dissolution has been used for a series of applications including cyanide quantification. Furthermore, it is significant to understand metal dissolution process in order to govern the stability in different chemical environment depending on the concentration, and types of ligand-functionalized. Effect of ligand-functionalized on the AuNP is investigated with spherical AuNPs by functionalizing the NPs with polymer, protein, thiolated polyethylene glycol (PEG) and small organothiols. The finding is important for understanding not only the ligand interaction of the multicomponent-functionalized AuNPs, but also AuNP dissolution processes. Moreover, once the colorimetric screening is established, we can use other techniques too such as SERS to monitor the dissolution process.

0497

DEVELOPMENT AND DEMONSTRATION OF ADVANCED ENGINE AND VEHICLE TECHNOLOGIES FOR CLASS 8 HEAVY-DUTY VEHICLE (SUPERTRUCK II)

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The SuperTruck program was created to address the U.S. DOE-VT Program's goal for improved fuel economy and reduced emissions. Through this project, heavy-duty manufacturers have developed a variety of highly efficient combustion and emissions strategies. The goal of the PACCAR Super Truck 2 Powertrain Optimization Project is to co-optimize for increased power and reduced fuel consumption, and emissions. As new engines systems are co-optimized, there is a strong need to understand the impact of the engine operating conditions and fuels, individually and acting together, on particulate emissions for the sake of efficient aftertreatment.

Previous work has specifically studied the impacts of fuel composition and additives on the emissions and efficiency. Additionally, particulate matter (PM) oxidation is a topic of long standing interest and of practical value, particularly for enabling Diesel Particulate Filers (DPFs). Specifically, alternative fuels, such as oxygenated biofuels, introduce a change in overall fuel composition such as H/C ratio, and change the stoichiometry of soot forming. Together these factors change the local chemistry associated with soot forming regions and oxidation characteristics as our laboratory studies and those of others have revealed. In particular our studies have shown that the relative ease of particulate oxidation changes with the extent of reaction and age of the particulate matter.

To support PACCAR in achieving this goal, Mississippi State University is working to investigate and quantify the impacts of engine operating conditions and fuels on particulate matter emissions with the goal of reducing the fuel penalty associated with treating exhaust emissions.

0500

A STRUCTURE - ACTIVITY STUDY ON THE BINDING OF MORIN WITH HUMAN SERUM ALBUMIN

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Plant flavonoids are ubiquitous in plant of higher genera, and are widely studied for their high therapeutic potency and low systemic toxicity. The present study is focused on a common flavonol morin (3, 5, 7, 2', 4'-OH flavone), which is widely present in citrus fruits. Till date, there is not enough literature data on the behavior of morin in physiological environment. Hence, an exploratory study on morin has been performed in protein microenvironment. Human serum albumin (HSA) is chosen as model for macromolecule. HSA is the natural carrier of drugs/small molecules in physiological system. Absorption, fluorescence, and circular dichroism (CD) spectroscopic measurements have been carried out at five different temperatures, 15, 20, 25, 30 and 37 °C to observe the influence of the structure of HSA on its binding with morin. Studies indicated morin binds in the hydrophobic cavity of HSA. Usually flavonols with a 5-OH group show fluorescence emission only when they are bound with a rigid environment. Morin's emission is distinctive from the well known flavonols fisetin (3, 7, 3', 4'-OH flavone), quercetin (3, 5, 7, 3', 4'-OH flavone) because the 2'-OH of morin makes an intramolecular H-bond with the -O- of chromone. Studies of morin with HSA at multiple temperatures indicated that structure of the protein influences the thermodyamics of the binding process. Acknowledgement: Institutional Development Award (IDeA) from the NIGMS under grant number P20GM103476, NSF-RIA award 1800732 and TIP award 1818528 for research support.

0525

SYNTHETIC APPROACHES TO PHOTOACTIVATABLE AROMATIC HETEROCYCLES FOR PHOTOINDUCED CELL DEATH

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N-Methoxy substituted aromatic heterocycles are photoactivatable compounds that produce two transient reactive species upon excitation. The reactive species, a methoxy radical and a heteroaromatic radical cation, have been shown to cleave DNA, which makes them candidates for photoinduced cell death. Applications of photoinduced cell death are found in Photodynamic Cancer Therapy. The efficiency of DNA cleavage is limited by weak ground-state association for the quinoline and isoquinoline derivatives. To increase cleaving efficiency, a DNA-binder (1,8-naphthalimide) has been synthetically attached. To further improve binding and cleaving efficiency, attempts to synthesize novel amino-heterocycles are undertaken. The goal is to shift the absorption maximum and have a flexible linker connection between heterocycle and naphthalimide. Our approach is to functionalize alkylquinolines or related heterocycles by radical bromination and then modify the products by various Grignard reactions or direct substitution with potassium phthalimide. Additionally, the use of some classical syntheses of heteroaromatic compounds such as the Bischler-Napieralski and Döbner-Miller Synthesis are potentially yielding target molecules. The isolation of the alkylamine proved to be the most challenging step and it appears that alkaline work-up does not yield the desired product. Consequently, reaction such as the Delepine reaction, which require acidic conditions, are selected. DNA-binding is determined by spectroscopic titrations and DNA-cleaving is evaluated by gel electrophoresis. Acknowledgement: This work was supported by the Mississippi INBRE, funded by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number P20GM103476.

0526

THE SYNTHESIS OF CHIRAL THERMOPLASTICS

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Our group is developing alternative thermoplastics from bio-based feedstock, which is a more sustainable resource compared to petroleum. In this regard, we are exploring the combination of lignin-derived precursors with bio-based chiral substrates containing various side chains to prepare a series of poly(ester amide)s. We utilize the melt polycondensation with antimony (III) oxide as a catalyst to prepare the polymers. The synthesized polymers exhibit excellent thermal stability, with onset temperatures above 370 ◦C. Moreover, the thermal properties of our polymers can be controlled by varying the size of the side chain on the substrate. Predictably, there is a lowering of the thermal stability that coincides with the increased size of the side chains. This feature allows us to control the processability of the materials. Additionally, the effect of the catalyst on the reaction condition has also been investigated. Scandium triflate is a stronger Lewis acid, relative to antimony (III) oxide, can more readily activate the reactive substrates, thus catalyzing the reaction to occur at a lower temperature in the polycondensation process. We will discuss our results of the preparation (including the effect of the catalyst), characterization and thermal properties of our polymers in this presentation. Overall, our method utilizes affordable bio-based starting materials to design thermally stable polymers that are also processable. Such polymers possess a variety of applications, such as in high strength composites, chiral resolution, and the like.

0527

N-SUBSTITUTED ISOQUINOLINES AS PHOTOACTIVATABLE COMPOUNDS FOR DNA-CLEAVAGE

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N-Methoxy substituted aromatic heterocycles are photoactivatable compounds that produce two transient reactive species upon excitation. The reactive species, a methoxy radical and a heteroaromatic radical cation, have been shown to cleave DNA, which makes them candidates for photoinduced cell death. Applications of photoinduced cell death are found in Photodynamic Cancer Therapy. The efficiency of DNA cleavage is limited by weak ground-state association for the quinoline and isoquinoline derivatives. To increase cleaving efficiency, a DNA-binder (1,8-naphthalimide) has been synthetically attached. To further improve binding and cleaving efficiency, attempts to synthesize novel amino-heterocycles are undertaken. The goal is to shift the absorption maximum and have a flexible linker connection between heterocycle and naphthalimide. Isoquinolines are aromatic heterocycles that can be synthesized by the Bischler-Napieralski Synthesis. Here an phenetylamine reacts with an acid chloride to produce an amide. This is then cyclized with a Lewis acid to yield 3,4-dihydroisoquinolines. Subsequent oxidation gives the isoquinolines. Functionalization via bromination of alkylisoquinolines and reaction with hexamine allows for conversion to the alkylaminoisoquinoline which is stable in its deprotonated form. Condensation with 1,8-naphthalic anhydride, N-oxidation and alkylation yields the desired bifunctional compounds.

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THE SYNTHESIS OF SMALL SENSORY MODELS FOR DEVELOP AS PH PROBES

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The concentration of certain analytes such as some metal ions, anions, pH, and reactive oxygen species play an important role in maintaining the metabolism processes in biological systems. Out of various techniques, fluorescence is one of the most highly used today for the detection and measurement of different analytes, due to low cost, high sensitivity and high spatiotemporal resolution. The xanthene-based dyes, fluorescein and rhodamine have unique structural and photophysical properties that allow them to act as chemosensors; thus many chemosensors based on these molecules have been the focus for many years.

Our group is focused on the synthesis of novel xanthene-based sensory molecules to use as pH probes. Our probes are based on modifying the xanthene core with a conjugated molecule; in order to investigate the effect on this moiety on the photoluminescence properties as well as the rate of the molecular switching mechanism. Here we are focusing on synthesis of the sensory molecules by modifying the spirolactam ring and xanthene core of fluorescein bis-triflate using Buchwald/Hartwig coupling and Suzuki coupling reaction conditions. In the reaction sequence, the spirocyclic ring is opened under acidic conditions and gives rise to a highly fluorescent form, while the neutral or basic were colorless. We will discuss our results of the preparation, characterization and properties of our small molecule in this presentation. Overall, this sensory models will be a better approach to analyze pH and selected analyte ions in a biological system.

0541

SUSTAINABLE POLY(ETHER AMIDE)S FROM LIGNIN-DERIVED PRECURSORS

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Petroleum-based products have dominated the commercial market for many decades. In recent years, there have been a concerted effort to replace petrochemical products with those from renewable sources due to the unsustainability of petroleum feedstock, and the continued volatility in the price. This work describes the synthesis and thermal properties of two new lignin-derived poly(ether-amide)s as alternative thermoplastics to petroleum-based commodities. Poly-4-(2-aminoethoxy)benzoate (PEAB) and poly-4-(2-aminoethoxy)-3-methoxybenzoate (PEAV) are synthesized by a melt polycondensation and characterized by ^{1}H NMR spectroscopy and thermal analysis. The number average molecular weight (M_n) of the polymers are estimated from the ^{1}H NMR spectroscopy analysis, and showed moderate to high conversion of the monomers at temperatures > 200 °C. PEAB has higher thermal properties compared to PEAV; albeit, a lower molecular weight is obtained for PEAB. The polymers have decomposition temperatures (T_d) in the range of 330 °C – 380 °C and glass transition temperatures (T_g) between 100 °C and 120 °C. The thermal properties of the polymers are in the desirable range for thermoplastic materials used in the packaging, storage, and coating industry. Furthermore, the polymers are susceptible to degradation under acidic conditions in a short period; a property that is highly desirable for degradable polymers.

0545

SYNTHESIS OF NOVEL WATER-SOLUBLE SEMICONDUCTING POLYRHODAMINE

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Conjugated polymers (CP) play a leading role in the field of developing organic semiconducting materials. These polymers have great electronic, thermal, and optical properties. In addition, they also have a better solubility, low-temperature processability, and mechanical properties when compared to conventional semiconductors. These characteristics are very important in applications such as display backpanels, sensors and active/passive matrix devices. Still the real-life applications of CP are limited due to major drawbacks, such as poor solubility in polar solvents and low reversibility of the redox reaction. This work describes the synthesis, chemical stability, redox properties, and sensory properties of a novel soluble electrical semiconducting polymer. The polymer was synthesized by a Buchwald/Hartwig cross-coupling reaction between fluorescein ditriflate and p-phenylenediamine. According to the UV-visible spectroscopic studies, the material showed very good chemical stability towards extremely acidic and basic conditions, even after several cycles back and forth. Furthermore, under acidic conditions, the wavelength of maximum absorbance (λmax) of the diluted polymer solution was blue shifted from 510 nm to 488 nm when it was exposed to hydrogen peroxide (H2O2). On the contrary, the basified polymer became colorless in the presence of H2O2. When doped with polyprotic acids such as polystyrene sulfonic acid, p-phenylene sulfonic acid and sulfuric acid, the material acted as an electrical semiconductor, and the cyclic voltammetry (CV) studies showed good redox stability with reversible redox potentials. The results obtained indicate that this polymer could be a building block for a sensory or energy storing material.

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Category: Science Education

0468

THE EFFECT OF AN INDIVIDUAL'S EDUCATION LEVEL ON THEIR SYSTEMS SKILL IN THE SYSTEM OF SYSTEMS DOMAIN

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The emergence of complex systems, e.g. System of Systems (SoS) is often exacerbated by a proliferation of information and rapid acceleration of technological advancements. The problems and behaviors resulting from increased complexity continue to surpass engineers' capabilities to maintain consistency within systems. Thus, practitioners in different disciplines and industries encounter the challenge of addressing the problems associated with SoS. In response, Systems Thinking (ST) aids in building a mental map that offers a robust conceptual understanding to offset the challenges of modern SoS problems. Using an established ST skills instrument, the purpose of the research is to gauge individuals' ST skills aptitudes based on their education level in the SoS domain. Two hundred and fifty-eight participants participated in the research with different educational qualifications; bachelor degrees, graduate degrees, and other/non-degree holders. The analysis of the responses was performed by a post-hoc test to show which groups were significantly different from other groups. Previous works of literature provided some insight into how educational level could impact an individual's systems thinking aptitude. Results showed that the difference between applicants labeled ‘others' and applicants with graduate- degrees was significant. However, no significant difference was found between applicants with a graduate degree and bachelor degree in aspect of ST capability and ST profile. From the results obtained through aggregate individual responses, we conclude that each group possesses a different ST skills profile, and educational level has a moderate impact on their system skills in SoS environment.

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Category: Mathematics, Computer Science, and Statistics

0475

BRUISED APPLES IDENTIFICATION USING FEATURE EXTRACTION AND CLASSIFICATION ALGORITHM

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We propose an algorithm for detecting bruised apples based on three dimensional 3D shape statistics acquired by a 3D infrared imaging system. The algorithm focuses on categorizing the apples into two classes: bruised apples and un-bruised apples. The proposed algorithm consists of two steps: feature extraction and classification.

For feature extraction, a vertex-based mesh local binary pattern operator is employed to extract binary patterns from 3D meshes.

For classification, we apply a support vector machine (SVM) classifier to train the feature vectors. Through experiments, we investigated and optimized the parameters of the proposed algorithm to achieve the highest identification accuracy. We compared the proposed algorithm with other algorithms. Experimental results show that the proposed algorithm achieved better performance for bruised apple identification than traditional algorithms, which indicates that the proposed algorithm has good potential in 3D shape analysis due to its high discriminative power.

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Category: Geology and Geography

0476

CHARACTERIZING THE GROUNDWATER QUALITY OF THE UPPER PEARL RIVER WATERSHED IN CENTRAL EASTERN MISSISSIPPI

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The Upper Pearl River and its watershed is the main source of water flowing into the Ross Barnett Reservoir, the City of Jackson's major drinking water supply. Groundwater characterization of the watershed was achieved by analyzing viable groundwater wells and a groundwater spring best representing the land use and land cover extraction map created. Incorporated surface geology demarcated specific stratum, helping describe the different hydrogeochemical interactions observed. Analysis indicated that chloride and nitrate exceeded the Maximum Contamination Levels (MCLs) possibly contributing to eutrophication in the reservoir. Several of the metal and trace elements analyzed were below the MCLs, with the exceptions of manganese, aluminum, and iron. No pharmaceuticals, pesticides, or industrial residues exists in Carthage and Philadelphia's groundwater, the largest cities in the region. Conclusively, the watershed's groundwater contains high concentrations of anions along with metal concentrations associated with the ferruginous sandy-clay surface geology moving closer to the reservoir.

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