THE OHIO STATE UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

20th Annual Undergraduate Research Forum

Tuesday, March 28, 2023
1:00 – 3:00 p.m.

Nationwide and Ohio Farm Bureau 4-H Center

2023 CFAES Undergraduate Research Forum
Tuesday, March 28, 2023

Table of Contents

Participant Index

Categorical Index

Animal Sciences – Animal Health (8 Projects)

Animal Sciences - Nutrition (1 Project)

Entomology (3 projects)

Environmental & Plant Sciences (13 Projects)

Name	Project Title	Abstract Page
Butler, Justin	Comparison of Heterodera glycines Egg Extraction Procedures	
Fite, Kristina	Understanding the Distribution of Microcystin in Lake Erie's Food Web	
Giganti, Aaron	Stream Metabolism Responses to Storm Events in Agricultural Headwater Streams	
Hu, Xucheng	Methods Comparison in Quantifying Soil Pyrogenic Carbon and the Influence of Soil Mineralogy and Crop Residues	
Johnson, Conner	The Soil-Carbon-Water Connection: Long-Term Impacts of Tillage/Drainage on Soil Health	
Lincicome, Matthew	Predator-Prey Interactions of Largemouth Bass in Response to Artificial Lighting at Night and Turbidity	
Marrero, Olivia	Rubber Dandelion Performance on Contaminated Soils	
McCarty, Jacob	History of Pesticide Use	
McQuain, Keely	A Comparison of Pythium Baiting Techniques	
Newman, Emma	Distribution, Abundance, and Virulence Profile of Soybean Cyst Nematode (SCN) in Ohio	
Phillips, Benjamin	Using Teleconnections Data to Predict El Nino-Southern Oscillation (ENSO) Effects on Precipitation in the Midwest	
Pilutti, Jack	Determining the Sex of Date Palm, Phoenix dactylifera, using Molecular Markers	
Stover, Ben	Effect of Varying Light Treatments on Lithops Window Diameter and Color	

Food Science (3 Projects)

Name	Project Title	Abstract Page
Bogdanovitch, Joseph	Deodorization of Onion Volatiles - Research In-Progress	
Gephart, Gabriella	Isolation of Antimicrobial-Producing Bacteria from Artisanal Cheeses and Characterization of Potentially Novel Antimicrobial Agents Produced	
Rich, Cameron	*In-situ* Screening for Gluten-Free Flours Using Chemometrics and Vibrational Spectroscopy	

Social Sciences (4 Projects)

Name	Project Title	Abstract Page
Graber, Samantha	Rural Maternal Health: An Assessment of News Frames	
Mason, Michaela	Exploring Historical and Contemporary Relationships Between OSU and CSU	
McGoey, Elena	Self-Regulated Learning Strategies Within an Online Introductory Animal Sciences Course	
Milliron, Hayley	Rural Ohio School Emergency Meal Distribution Plans in Response to COVID-19	

Judges

Sherifat Alabi (Department of Agricultural Communication, Education, and Leadership)

Dr. Sheryl Barringer (Department of Food Science and Technology)

Patricia Boley (Department of Animal Sciences)

Dr. Steve Boyles (Department of Animal Sciences)

Dr. Wanderson Bucker Moraes (Department of Plant Pathology)

Ben Carignan (CFAES Academic Programs)

Dr. Tyler Carr (Department of Horticulture and Crop Science)

Dr. Cecilia Chagas de Freitas (Department of Plant Pathology)

Dr. Kellie Claflin (Department of Agricultural Communication, Education, and Leadership)

Dr. Kimberly Cole (Department of Animal Sciences)

Priyadarsini Das (Department of Agricultural Communication, Education, and Leadership)

Dr. Warren Dick (School of Environment and Natural Resources)

Benjamin Duran (Department of Animal Sciences)

Dr. Jeff Firkins (Department of Animal Sciences)

Dr. Lyda Garcia (Department of Animal Sciences)

Dr. Shristi Gaur (Department of Food, Agricultural, and Biological Engineering)

Dr. Monica Giusti (Department of Food Science and Technology)

Richard Gonzalez (Department of Plant Pathology)

Dr. Andrea Gschwend (Department of Horticulture and Crop Science)

Demilade Ibiwoye (Department of Animal Sciences)

Dr. Shoshanah Inwood (School of Environment and Natural Resources)

Dr. Dee Jepsen (Department of Food, Agricultural, and Biological Engineering)

Dr. Reed Johnson (Department of Entomology)

Dr. Scott Kenney (Department of Animal Sciences)

Jaelene Loor Suche (Department of Agricultural Communication, Education, and Leadership)

Ashish Manandhar (Department of Food, Agricultural, and Biological Engineering)

Lily Mank (School of Environment and Natural Resources)

Dr. Leah McHale (Department of Horticulture and Crop Science)

Dr. Megan Meuti (Department of Entomology)

Mackenzie Miller (School of Environment and Natural Resources)

Judges

Sachin Naik (Department of Horticulture and Crop Science)

Dr. Ali Nazmi (Department of Animal Sciences)

Sunny Park (Service Testing and Research Laboratory)

Ali Peart (Department of Plant Pathology)

Dr. Peter Piermarini (Department of Entomology)

Dr. Krystal Pocock (School of Environment and Natural Resources)

Dr. Brian Raison (Department of Agricultural Communication, Education, and Leadership)

Dr. Luis Rodriguez-Saona (Department of Food Science and Technology)

Dr. Tiffanna Ross (Department of Plant Pathology)

Dr. Mitchell Roth (Department of Plant Pathology)

Elizabeth Share (Department of Animal Sciences)

Dr. Jonathon Van Gray (Agricultural Technical Institute)

Dr. Brooklyn Wagner (Department of Animal Sciences)

Dr. Macdonald Wick (Department of Food Science and Technology)

Dr. Roger Williams (School of Environment and Natural Resources)

Sarah Williams (CFAES Academic Programs)

Animal Sciences – Animal Health (8 Projects)

Enhancing the Welfare of Dairy-Beef Calves via Oral Electrolyte Solutions on Arrival at Calf-Raising Facilities

Amanda Ackerman, Z. England, G. Habing, A. Niehaus, and Dr. J. A. Pempek. Department of Animal Sciences.

Shortly after birth, most surplus dairy calves are sold through live auctions, livestock markets, or both for dairy-beef or veal production. This sale process can lead to prolonged fasting and long transport times, and previous research has identified a high prevalence of calf dehydration on arrival at calf-raising facilities. Therefore, the objective of this randomized field study was to investigate the duration of oral electrolyte solutions (OES) on calf behavior and health after arrival at a calf-raising facility. In this experiment, 2 cohorts of 60 calves were used. Calves (n=30 per treatment) were randomly assigned to 1 of 4 treatments on arrival: 1) 1-d OES; 2) 2-d OES; 3) 3-d OES; or 4) no OES (control). On arrival (d 0), calves were fitted with 3-dimensional accelerometers on their right hind leg to continuously measure lying time, number of lying bouts, and lying bout duration. Calves were evaluated on d 0, 1, 2, 3, and 7 for signs of dehydration (via skin tent test), arthritis, navel inflammation, diarrhea, respiratory disease, and fever. Poisson regression models were used to test differences between treatments in behavior and disease frequency. On arrival, 47.5% (95% Cl: 38.4-56.6%) of calves were mildly dehydrated (skin tent 2-3 s), and 42.5% (38.4-51.5%) of calves were moderately dehydrated (skin tent 4-9 s).The frequency of moderate dehydration was lower for calves that received 2-d OES compared to the control (Rate ratio: 0.58; 0.37-0.92%; P=0.02); however, OES treatment did not influence the frequency of other health measures. Immediately post-transport (d 0), calves spent the most time lying compared to subsequent days, but there was no effect of OES treatment on lying time. Future research should investigate preconditioning nutritional strategies to reduce calves' risk of dehydration.

Evaluating the Effect of Placental Lactogen on Fatty Acid Concentration and Hepatitis E Virus Replication in Human Liver Cells

Kara E. Flaherty, Kush K. Yadav, Scott P. Kenney. Center for Food Animal Health, Department of Animal Sciences.

Hepatitis E Virus (HEV) is a leading cause of acute hepatitis worldwide and an emerging zoonotic concern. This virus infects a wide range of animal species, with genotypes having shown transmission from animals to humans. It has been well established that HEV causes an increased mortality rate in pregnant individuals, although the cause remains unknown. This pregnancy mortality is also seen in rabbits, who share the same placenta and various placental hormones including placental lactogen (PL). Preliminary data suggests HEV alters fatty acid concentrations in cells and PL is also known to regulate fatty acid synthesis. The goal of this study was to evaluate placental lactogen increases on viral replication and fatty acid synthesis. The human liver-derived, tumorigenic cell line Huh7 was used. For experiment one, building a kinetic profile of fatty acid concentration in Huh7 cells under PL treatment, cells were seeded into two groups with and without PL. PL was added every 12 hours until day 6 and then harvested and checked for fatty acid concentration. For experiment two, determining the effect of PL and HEV on fatty acid concentration in Huh7 cells, three groups were used with cells only; cells and PL; and cells, PL and HEV. Cells were seeded and PL was added every 12 hours until day 6 when they were then harvested and checked for fatty acid concentration. For experiment three, determining whether genotype 3 HEV replication is enhanced in Huh7 cells treated with PL, four groups were used with cells and HEV; cells, PL and HEV; cells and PL; and cells only. Cells were seeded and transfected on day 0, cell passage was performed on day 2, cells were harvested on day 6, and then used to detect HEV ORF2 protein using flow cytometry and immunofluorescence assay. PL was shown to increase the concentration of fatty acid in Huh7 cells over time ($p < 0.05$). Both HEV and PL independently increased fatty acid concentration in cells ($p < 0.05$ and $p < 0.01$). Enhanced replication was also seen in PL treated cells ($p < 0.05$).

Animal Sciences – Animal Health

Applications of Adult Reptilian Neurogenesis in Mammalian Brains
Amanda Folwell and Dr. Benjamin Bohrer. Department of Animal Sciences.

Adult neurogenesis, which is the development of new neurons in the brain, is a process that is only rarely seen in adult mammals but is commonly seen in a variety of adult reptiles typically after an injury. Reptiles and mammals have similar brains with several homologous areas, so the study of reptilian adult neurogenesis could lead to the discovery of mammalian adult neurogenesis, particularly in the cortex and other telencephalic divisions. Due to the many documented cases of reptilian adult neurogenesis, a thorough review of the literature is necessary to design a study that would involve the use of reptilian models to identify any gene(s) causing adult neurogenesis to occur and then identifying a homologous adaptation in mammalian models. From there, studying that adaptation to see what might turn on adult neurogenesis in mammals. Finally, this information could help develop new treatments for illnesses and injuries that would cause the loss of functioning brain tissue in mammals, such as Alzheimer's disease and rabies.

Effects of Seasonal Housing Differences on Hair Cortisol in Giraffe (giraffa camelopardalis)
Joe Gryboski and Dr. Kelly George. Department of Animal Sciences.

The purpose of this study is to quantitatively measure cortisol concentrations in giraffe at the Columbus Zoo as they experience environmental changes over the summer and winter months. Cortisol is a hormone that is released in an animal's body during times of stress. Acute, or short term, levels of cortisol can be measured to look at temporary stressors in an animal's life. However, this study is looking at the long-term deposits of cortisol that reside in animal's hair, known as the hair cortisol concentration (HCC). The first objective is to establish baseline HCC for the sample population and for each giraffe to serve as their own control. These levels will offer insight into the welfare of the animals by the tracking of HCC changes over time. This initial study is exploratory, as there is no published work on giraffe hair growth rate or baseline HCC levels for any giraffe species or subspecies. We will be working with giraffe keepers at the Columbus Zoo and Aquarium to shave several giraffes on their neck, back hip, and legs multiple times over the coming months to establish a known shave location, hair growth rate, and training of the animals to afford comfort during the procedure. The expectation is to shave the giraffe five or six times over the course of the study, should their hair grow that fast. The shaved hair will be sent to the OSU College of Nursing Stress Science Lab for analysis, and results will be reviewed and shared. This project is still in the data analysis phase, so only the initial findings pertaining to hair growth rate can be shared. Through this study, we are building upon advances in animal welfare science, by adding giraffe to the species list, and plan to use our findings to guide staff in management decisions to benefit each animal's welfare.

Animal Sciences – Animal Health

Assessment of Circulating Anti-Mullerian Hormone During Pregnancy in Beef Cattle
Alexandra F. Incarnato, Alexandria E. Crist, Jessica C. L. Motta, Cameron B. Hayden, Dr. Alvaro Garcia-Guerra. Department of Animal Sciences.

Anti-Mullerian Hormone (AMH) in males is produced by Sertoli cells and plays a role in sexual differentiation. In females, AMH is produced by granulosa cells and is positively correlated with antral follicle count and the number of embryos produced after in vitro embryo production (IVEP) in cattle. Typically, AMH is evaluated in non-pregnant cattle. The aim of this study was to assess the effect of fetal sex and gestation period on maternal circulating AMH concentration in cattle. Pregnant beef cows carrying a single fetus were utilized in the study. Cows were timed artificially inseminated and pregnancy diagnosis was performed using ultrasonography at 35, 60, 90, 120, 180 and 240 days after insemination. Fetal sex was determined at day 60 and confirmed at birth. Plasma samples were collected at 0, 35, 60, 90, 120, 180, and 240 days of pregnancy and assayed for AMH using a commercially available ELISA. A linear mixed model with repeated measures was used to evaluate differences in AMH and Pearson correlation coefficients were utilized to assess the association between AMH at different timepoints. Twenty cows carried a female fetus while 22 carried a male fetus. There was an effect of gestation day ($P<0.001$) on maternal circulating AMH, however, there was no effect of fetal sex ($P=0.14$) nor a fetal sex by gestation day interaction ($P=0.91$). Maternal AMH at day 180 (982.9±75.6 pg/ml) was greater ($P<0.001$) than at any other timepoint. Circulating AMH at 60 (686.5±61.3 pg/ml), 90 (744.1±61.6 pg/ml), 120 (674.5±60.6 pg/ml) and 240 (799.3±63.6 pg/ml) days was greater than at 35 (586.42±57.1 pg/ml) days which was greater than at 0 days (493.0±44.7 pg/ml). There were positive correlations between circulating AMH at day 0 and at: 35 ($r=0.91$; $P<0.001$), 60 ($r=0.86$; $P<0.001$), 90 ($r=0.76$; $P<0.001$), 120 ($r=0.69$; $P<0.001$), 180 ($r=0.69$; $P<0.001$) and 240 ($r=0.68$; $P<0.001$) days. In conclusion, maternal circulating AMH is not affected by fetal sex, however, it is affected by gestational stage. Nevertheless, circulating AMH during pregnancy is positively correlated with AMH determined before pregnancy establishment supporting its potential use as a biomarker for embryo production.

The Use of Acceptance and Avoidance Behaviors Expressed by Various Species to Evaluate Animal Response During Brief Human-Animal Interactions
H. Largen, S. Kelley, N. Lorig, Dr. K. Cole. Department of Animal Sciences.

Although human-animal interactions (HAI) have been shown to be beneficial to human health, there is little evidence to demonstrate the influence on the wellbeing of animals used in this capacity. Behavioral observation has been used as an indicator of well-being and can be used to understand animal response to HAI. The aim of this study was to assess the behavioral responses of various animal species during brief HAI using acceptance and avoidance behaviors. An ethogram was created defining acceptance behaviors as head or body movement toward human and relaxed posture facing human. Avoidance behaviors were defined as head or body movement away from human and relaxed posture facing away from human. Interactions included one participant and two animals of the same species (donkeys, goats, or dogs). Interactions were video recorded and scan sampled every ten seconds. Data were analyzed using PROC T-TEST and PROC MIXED in SAS v 9.4. Results indicated a significantly higher average display of acceptance behaviors compared to avoidance behaviors across species ($p < 0.001$). However, no differences were noted in acceptance behaviors between species. Avoidance behaviors were found to be displayed more frequently among dogs and donkeys compared to goats ($p = 0.009$). While no differences were observed for Facing Away, dogs expressed more Moving Away compared to the other species ($p < 0.001$). There was a significant difference between individual animals with Dog 2 expressing a greater frequency Moving Away than Dog 1 ($p = 0.011$). Interestingly, the only predatory species, dogs, exhibited the highest frequency of avoidance behaviors when compared to both prey species. The higher frequency of acceptance behaviors displayed across species may suggest that, among this sample, HAI did not negatively influence the animals. However, differences noted between individual dogs suggest that individuality of the animal may play a role in their response. More research is needed to evaluate the use of acceptance and avoidance as a measure of animal response to HAI.

Animal Sciences – Animal Health

Influence of Localized Massage on Biobehavioral Responses of Mature Horses During Exposure to Unfamiliar Stimuli

S. Maddocks, N. Lorig, J. McNally, H. Largen, and Dr. K. Cole. Department of Animal Sciences.

Exposure to unfamiliar stimuli can lead to increased heart rate (HR), increased incidence of locomotor behaviors, and changes to facial expressions. Responses of horses to unfamiliar stimuli can have important consequences for both horse and human safety. Horses preferentially groom conspecifics in preferred areas, and imitated grooming of horses in this location has been shown to decrease horse HR. The objective of this study was to determine if localized massage along the preferred area would influence HR, behavior, and facial expressions during exposure to unfamiliar stimuli. Eleven Quarter Horse mares (11.6 ± 4.9 yr) were fitted with a Polar H10 HR monitor and led from their group housing area to an open-front stall in a barn. After 5 min pre-stimulus (P1), hair clippers were turned on and held 30.5 cm from the horse's left ear for 3 min consisting of: stimulus/pre-massage (45 sec; P2), stimulus/massage (90 sec; P3) and stimulus/post-massage (45 sec; P4). Afterward, the clippers were turned off for 5 min (P5: post-stimulus). HR and video recording occurred throughout the experiment. Scan sampling of videos was used every 15 sec during P1 and P5, and every 5 sec during P2-P4 to determine counts of behavior and facial expressions. Data were analyzed using PROC MIXED in SAS v. 9.4. Significant differences in HR, locomotor behaviors, and facial expressions were observed between horses in the study, highlighting the role of individual variation among horses. No differences were observed in HR during P2-4 compared to P1 and P5. Horses moved their hind feet more frequently during exposure to the clippers once the localized massage stopped ($p < 0.05$). The frequency of ears in a relaxed position was greater during P3 ($p < 0.01$). Although these findings indicate that localized massage may reduce stress-related behaviors and facial expressions during exposure to unfamiliar stimuli, more research in this area is needed.

Use of Biobehavioral Responses During a Novel Object Test to Assess Suitability of Horses for Equine Assisted Services

J. McNally, N. Lorig, S. Maddocks, H. Largen, K. Vickers, A. Holsinger, J. Foos, and Dr. K. Cole, Department of Animal Sciences.

Recent studies demonstrated positive outcomes for human participants in a variety of equine assisted services (EAS). Individual variation in the personality characteristics of horses, including their reactivity, may create safety concerns and influence therapeutic outcomes. There are no existing standardized guidelines for the selection of equine for use in EAS. Behavioral observations have been used to assess the potential suitability of equine participants. However, overall behavior of individual horses can be challenging to objectively measure. Novel object (NO) tests are often used to assess reactivity in equine and other species. To our knowledge, no study has used NO testing to evaluate reactivity as a measure of suitability for groundwork-based EAS. The purpose of this study was to assess biobehavioral responses of 10 Quarter Horse mares (11.6 ± 4.9 yr) during a NO test as a measure of their suitability for participation in EAS. The experiment consisted of three consecutive 5 min periods: Pre-NO test (P1), NO test (P2), and Post-NO test (P3). HR was recorded using a Polar H10 Equine HR monitor. Scan sampling every 10 sec was used to record behavior. Data were analyzed using PROC MIXED in SAS v 9.4. Horse HR differed by horse and decreased with time within all three periods ($p < 0.01$). During the NO test, locomotion increased with increasing proximity to the NO ($p < 0.05$). Standing alert and exploratory behaviors decreased during the NO test but were not influenced by the horse's location ($p < 0.03$). Interestingly, eating behaviors increased during and after the NO test ($p < 0.05$). Although behavioral and physiological responses were influenced by individuality and environment, the reduction over time within each period suggests their ability to quickly acclimate to changes in their environment. However, future studies with additional novel objects and horses are needed to determine if the use of this methodology can serve to evaluate suitability of horses for EAS.

Animal Sciences – Nutrition (1 Project)

Fit or Flabby: Can We Simplify the Body Condition Scoring System?
Elizabeth M. Schafer and Dr. Benjamin A. Wenner. Department of Animal Sciences.

Body condition scoring (BCS) on a 1-5 scale is a common method of assessing dairy cow body fat reserves, serving as a management tool to consistently identify patterns and address herd nutrition, reproduction, and health. However, the efficacy of scoring in different BCS point increments has not been well described. Our objective was to evaluate the variation in BCS based on scoring in half- or quarter-point increments and to evaluate the accuracy of categorically assessing cows as fat, thin, or ideal (CAT) for current lactation stage compared to assigning traditional BCS. Our hypothesis was that scoring on the half-point increment would not increase variation of managerial value. We further hypothesize that CAT score would be interpretively similar to traditional BCS. Jersey cows (n=20) balanced by lactation stage were scored by undergraduate students (n=14) of varying experience for 6 weeks. Prior to trial initiation, all participants received BCS training and were provided a scoring guide to use on-farm. Once a week, participants scored cows in quarter-point (QRT) and half-point (HALF) increments, and CAT score. Statistical analysis included a SAS mixed-model approach (fixed effects: scoring method, lactation stage, week, scorer experience; random effects: scorer, cow) with repeated week as appropriate; residuals (HALF-QRT) regressed against HALF centered to the mean. Regression of the residuals indicated a mean bias ($P<0.01$) where HALF underestimates herd BCS by 0.025 and a slope bias ($P<0.01$) over increasing BCS, HALF decreased by 0.118 for every whole point BCS. Method of BCS influenced mean score ($P<0.01$) where CAT was lower than QRT or HALF by 0.05. While experience and lactation stage had no effect ($P\geq0.33$), variance of QRT and HALF were not different ($P=0.60$) while CAT produced greater variance than QRT or HALF ($P<0.01$) by an average of 0.109. These data indicate that HALF score could be equally accurate as QRT, while potentially decreasing producer effort and time to score. Additional work is needed to support these results on farms with different breeds and management styles and with scorers of different ages and backgrounds.

Entomology (3 Projects)

Understanding How Light Pollution Affects Mosquito Blood-Feeding and Molecular Biology
Maria Fiorta, Dr. Megan Meuti. Department of Entomology.

Female Northern house mosquitoes, Culex pipiens, transmit serious diseases including West Nile virus. Females survive the winter by entering diapause, an arrested state in which the females store fats and stop blood feeding and reproductive processes. Diapause is cued by photoperiod, so as days become shorter in late summer and early fall these mosquitoes prepare for the winter, which typically effectively stops the disease transmission period. Artificial light at night (ALAN) has been shown to cause C. pipiens to avert diapause in the lab. However, we do not know if ALAN in the field causes similar effects or what are the molecular mechanisms underlying these changes. To determine whether ALAN in the field stimulates blood feeding in mosquitoes I measured the number of field reared ALAN-exposed and unexposed mosquitoes that consumed a blood meal from an artificial blood feeder over a period of two hours. I will also characterize the relative abundance of Insulin-like peptide-1 (Ilp-1) transcripts in ALAN-exposed and unexposed mosquitoes using quantitative real time PCR. I hypothesize that Ilp-1 will exhibit increased expression in the ALAN-exposed mosquitoes as this will allow them to better process blood meals and maintain lower levels of fat than their non-ALAN-exposed, diapausing counterparts. Completion of this project will tell us how mosquitoes are being affected by ALAN both phenotypically and molecularly. This will shed light on mosquito seasonal responses and aid in better understanding the disease transmission cycles.

Entomology

The Study of Effects of Urbanization on the Abundance and Richness of Dominant Beetle Species in the Columbus Area

Kiya Hailu, Lucy Guarnieri, Dr. Mary Gardiner. Department of Entomology.

The urbanization of natural habitats and expansion of advanced infrastructure have been rapidly growing in recent years within Columbus, Ohio. Beetle species have been decreasing in numbers worldwide. This is a significant matter as beetle species are advantageous to human life within both urban and suburban spaces. The declination of their abundance and richness can negatively impact the ecosystem relative to wildlife as well as the human species. Beetles are a dominant food source for multiple species and aid in bio control, serving as an ecosystem treatment due to them being natural enemies of heavily abundant species. Similarly, in suburban areas heavily occupied by mass green spaces and farmland, have also seen a decline beetle population. This is due to several advancements such as new agriculture technology, over usage of pesticides, and several other factors. With this knowledge, our primary objective is comparing the abundance and richness relative to the intensity of urbanization in the Columbus area. We will investigate this by identifying dominant beetle species in Columbus Metroparks and recording their abundance and richness through data collection. We essentially collected beetles from eleven field sites along an urbanization gradient in Columbus, Ohio using black light traps. The beetles were then distinguished morphologically according to species and pinned for visual observation. The results of this study will contribute to the understanding of the beetle declination trend in urban areas.

Evaluating Geospatial, Human Behavioral, and Social Drivers of Mosquito Abundance and West Nile Virus Disease Risk

Sydney Robare, James Odei, and Dr. Megan Meuti. Department of Entomology

Culex mosquitoes transmit West Nile virus (WNV) in the continental United States. Previous research has shown that Culex mosquitoes are more abundant in low-income areas, possibly leading to inequitable disease burdens across a wealth-health gradient. Few studies have reviewed how personal knowledge, attitudes, and practices (KAP) affect mosquito populations at a community scale. The CDC used U.S. census data to develop the Social Vulnerability Index (SVI) as a measurement of social inequity. We review how social inequity affects mosquito populations at a community level. Specifically, we examined whether community KAP and SVI levels are predictive of mosquito population and WNV disease trends. We created areal interpolation modeling maps using ArcGIS software to compare community SVI values against mosquito populations and WNV disease trends from two central Ohio health departments. We also administered a KAP survey that received approximately 330 responses from central Ohio residents that were spatially compared against mosquito populations and WNV disease trends from one central Ohio health department. Data analysis is ongoing, but we predict that communities with higher SVI and lower KAP indexes will be correlated with higher mosquito populations and earlier onset of disease incidence. This study provides a foundation for future work to review the social and institutional factors affecting mosquito and WNV disease ecology, and thereby better equip public health institutions to protect their populations from mosquito-borne disease.

Environmental & Plant Sciences (13 Projects)

Comparison of Heterodera glycines Egg Extraction Procedures

Justin Butler, Zak Ralston, and Dr. Horacio Lopez-Nicora. Department of Plant Pathology.

Soybeans are one of the most economically important crops with an excess of 4.9 million acres grown in the United States alone. Even though the U.S. produces over 4 billion bushels of soybeans yearly, that number could be much higher. Heterodera glycines (soybean cyst nematode) is responsible for an estimated decrease of 30% of the final yield. This leaves a possibility of 1.3 billion bushels of soybeans that are not grown due to yield reductions. In order to innovate new technology, we first must be able to accurately count and estimate populations of Heterodera glycines in fields across the country. Today we still use antiquated methods for extracting eggs of Heterodera glycines. Once extracted these eggs are counted under a microscope. This process, while effective, is time consuming and is impractical for labs testing hundreds of samples a day. To fix this, I propose an idea that can possibly shorten the time needed in order to extract eggs by adding a little automation and giving the possibility to run multiple samples simultaneously. To test this, we developed a prototype of a cyst grinder that has the capability to be run side by side to other units simultaneously. This prototype is a work in progress and will progress once further testing is completed.

Understanding the Distribution of Microcystin in Lake Erie's Food Web

Kristina Fite, Richard Budnik, Manjunath Manubolu, David Bolgrien, Kelly Bowen, Kaitlyn Busch, Paris Collingsworth, Ann Cotter, Warren Currie, Chad Harris, Joel Hoffman, Jim Hood, Terri Jicha, Mike Kulasa, Mohi Munawar, Lars Rudstam, James Watkins and Stuart Ludsin. Department of Evolution, Ecology, and Organismal Biology.

A global resurgence of harmful algal blooms containing large quantities of cyanobacteria (cyanoHABs) negatively impacts aquatic ecosystems by increasing hypoxic zones, depleting water clarity, and contaminating freshwater. Human-driven climate change has exacerbated cyanoHABs resulting in an increase in cyanotoxins. One toxin, in particular, Microcystin, is a potent liver toxin that can be found in water systems used for recreational and commercial purposes. Additionally, this toxin can be directly stored within fish tissue which can be transferred to humans upon consumption of a contaminated individual ultimately causing a serious health risk to humans. Despite the World Health Organization (WHO) regulating the amount of MC found in food sources and drinking water, there is still little known about how MC moves through each trophic level of the food web and into the tissue of different fish species. Therefore, this study focuses on the amount of MC found in fish species that are located inside cyanoHABs relative to fish species found outside of cyanoHABs. Our data shows that fish species inside of cyanoHABs contain higher levels of MC when compared to fish species found outside of cyanoHABs. Understanding the total levels of MC found in fish species will help us reinforce our current regulations on MC found in important water systems as well as establish new fishery management strategies for the future.

Environmental & Plant Sciences

Stream Metabolism Responses to Storm Events in Agricultural Headwater Streams
Aaron Giganti and Peter C. Smiley, Jr., USDA/School of Environment & Natural Resources.

Dissolved oxygen is an essential indicator of habitat quality in aquatic ecosystems. In streams, dissolved oxygen production (gross primary production; GPP) is facilitated by photosynthetic activity, and dissolved oxygen consumption occurs through ecosystem respiration (ER). Together, these constitute net ecosystem production (NEP). Streams exhibit diel patterns of dissolved oxygen with daily patterns in light availability and temperature functioning as determinants of NEP. Storm events disrupt typical patterns of light, temperature, nutrient concentrations, and flow, and may subsequently affect dissolved oxygen and NEP in streams. However, limited information exists on the effects of storm events on dissolved oxygen and NEP in streams, especially within channelized agricultural headwater streams. I hypothesized that diel dissolved oxygen concentration variability and GPP will decrease during storm events compared to baseflow within channelized agricultural headwater streams. I measured dissolved oxygen and water temperature continuously from June to August 2022 with four dissolved oxygen and water temperature data loggers in two channelized agricultural headwater streams in central Ohio. At each site I measured water depth continuously with water level data loggers and periodically measured water depth, water velocity, and wetted width. I plan to use linear mixed effects model analysis to determine if the variability of daily dissolved oxygen concentrations and GPP differs between baseflow and storm events. My research results will document the effect of storm events on stream metabolism. This information will enable watershed managers to develop strategies for mitigating the impacts of increasing storm events predicted as part of climate change.

Methods Comparison in Quantifying Soil Pyrogenic Carbon and the Influence of Soil Mineralogy and Crop Residues
Xucheng Hu and Dr. Scott Demyan. School of Environment and Natural Resources.

Pyrogenic Carbon (PyC), also known as Black Carbon (BC), is the product of incomplete combustion of organic matter and is ubiquitously present on Earth. Compared to the labile characteristic of non-pyrogenic origin soil organic matter, PyC is refractory and relatively persistent in the soil. Pyrogenic carbon application to the soil has been shown to be effective for contaminant remediation, soil fertility improvement, and carbon sequestration. The intricate and complex molecular structure of PyC and range in transformation of original organic matter from lightly charred to highly condensed compounds leads to difficulties in quantifying PyC content, as soils contain not only PyC but other forms of non-PyC organic matter of different chemical qualities. This study aimed to compare the accuracy of two different methods used in quantifying PyC content in the soil, and to clarify possible influences of non-PyC organic matter on quantifying soil PyC. Chemo-thermal oxidation at 375°C (CTO-375) followed by elemental analysis of carbon and Visible Near-Infrared (VNIR) spectroscopy were the PyC methods compared. Model soil and PyC mixtures were made with known amounts of softwood biochar (as an example of PyC) along with corn residue (as an example of organic matter) added to four B-horizon soils of different textures. B-horizons were used as they are low in total organic carbon and likewise hypothesized to be very low in PyC content. Organic amendments were added at 0.5% and 5% (w/w) representing hypothetical rates of PyC used as a soil amendment, along with pure biochar and plant residue and unamended controls. VNIR wavelengths at 825 nm, 1100 nm, and 1650 nm, corresponding to aromatic structures, are hypothesized to represent PyC, and investigated to see the response to biochar and/or plant residue addition. Samples following the CTO-375 thermal treatment are pending acid treatment and elemental analysis and are expected to show the accurate PyC amount with the different soil and biochar mixtures and effects of possible interference of plant residue with PyC quantification. Expected results are the associated VNIR wavelengths associated with C=C bonds will have lower reflectance indicating increased aromatic structures when more PyC is present in the soil.

Environmental & Plant Sciences, continued)

The Soil-Carbon-Water Connection: Long-Term Impacts of Tillage/Drainage on Soil Health
Conner Johnson, Dr. Rattan Lal. School of Environment and Natural Resources.

Soil organic carbon (SOC) affects many soil processes and properties. It has a significant effect on hydraulic properties, as it is able to hold many times its weight in water and increases soil aggregation, which affects water infiltration. However, it can be difficult to precisely predict the effects of SOC changes on parameters like plant-available water capacity or infiltration, which involve complex factors. Likewise, it is difficult to predict the effects of farm practices such as tillage and drainage on organic carbon. This highlights the need for well-controlled, long-term field studies. This study aims to evaluate long-term effects of drainage and tillage (and the interactions between) on soil physical and hydraulic properties, and to plot those soil carbon changes against historical biomass input. Methods:- 6 core samples and bulk samples taken from each of 12 field sites and 1 forest site at 2 different depths, 0-7.5 cm and 7.5-15 cm. - Soil texture analysis by hydrometer method; - Aggregate stability evaluated using wet sieving; - Plant-available water capacity and pore-size distribution analyzed using tension tables and pressure chambers; - SOC content measured by dry combustion in bulk samples and in the micro- and macro-aggregate fractions; - Particle size distribution determined using the hydrometer method; - Water infiltration using the Cornell sprinkle infiltrometer in the field. Results: The no-till plots tend to have more and larger water-stable aggregates as well as higher SOC content. Artificial drainage was associated with lower aggregation and SOC. Plots with higher SOC also tended toward greater plant-available water content and higher water infiltration rate. The strength of these effects will be determined when remaining replications are analyzed. Biomass data will then be compared to SOC changes. Conclusions: This study highlights the importance of no-tillage for soil health and carbon management. It may also contribute robust field data to improve carbon modeling, especially under complex management systems.

Predator-Prey Interactions of Largemouth Bass in Response to Artificial Lighting at Night and Turbidity
Matthew Lincicome, Dr. Mažeika Patricio Sullivan, Dr. Jason Bohenek. School of Environment and Natural Resources.

Artificial lighting at night (ALAN) is ecological pollution; this, combined with increased turbidity, may be contributing factors of fishes foraging attempts. To assess the effects of ALAN and turbidity on predation success, I conducted a mesocosm experiment with largemouth bass (Micropterus salmoides) and fathead minnows (Pimephales promelas). I applied four different light treatments (0 lux, 0.5 lux, 3 lux, 10 lux) across two different water treatments (clear and turbid), then counted the prey minnow remaining daily. Foraging success was greater in clear mesocosms in the beginning compared to turbid mesocosms showing that largemouth bass initially had reduced success under turbid conditions. High turbidity conditions made it difficult for the largemouth bass to locate and consume the prey minnow. Indicating that the dynamics of the top-down trophic guild may be affected under high turbidity and sedimentation, creating a bottom-up dynamic. I hypothesized that predator-prey interactions would be reduced under ALAN and turbid conditions.

Rubber Dandelion Performance on Contaminated Soils
Olivia Marrero, Dr. Katrina Cornish, and Dr. David Barker. Department of Horticulture and Crop Science.

Rubber dandelions (Taraxacum kok-saghyz) are a suitable and crucial replacement for rubber trees because they produce high-quality natural rubber. This work explores the success of three Taraxacum kok-saghyz populations in four soil types to see if the soil can be used to grow the rubber crop. Sixteen five-gallon buckets of soil from the Remnant Zone (Control Soil), Permit Zones A (highly contaminated), B (moderately contaminated), and D (mildly contaminated) were collected from The Wilds - Columbus Zoo. Three seed types - Golf, Foxtrot, and Wild type - were planted in triplicates in the four soil types. The germination rates of each tray were counted and analyzed. The Golf seeds had the highest germination and plant survival rates while the Wild type performed the poorest. The Control Soil had a higher survival rate than Permit Zone A which had the lowest. Since dandelions have previously demonstrated that they uptake heavy metals, ICP analysis post-survival can be completed to assess the potential of rubber dandelions as a dual-purpose industrial and remediation crop species.

Environmental & Plant Sciences

History of Pesticide Use
Jacob D. McCarty

In the last two centuries many technological advances that have allowed for greater food production per unit land area. One major development has been through the use of pesticides that reduce yield losses from insects, diseases, and weeds. Some of these chemicals have origins in natural compounds such as Bacillus thuringiensis, while others were developed through synthetic chemistry as was the case for DDT. Others such as 2,4-D originated from research on plant growth hormones. Pesticides have allowed farmers to lower pest species in their fields and greenhouses to minimize yield losses. However, some of these chemicals have been removed from use by governmental organizations while others were discontinued due to better alternatives being discovered and coming to market. All of these pesticides have allowed US farmers to maintain a larger crop to feeding the world's growing population.

A Comparison of Pythium Baiting Techniques
Keely McQuain, Jenna Moore, Zak Ralston, and Dr. Horacio Lopez-Nicora. Department of Plant Pathology.

Pythium is a soil-borne oomycete pathogen that causes soybean seedling-damping off and seed rot soon after planting, thus resulting in large economic yield losses. Soil baiting techniques are amongst the most common methods to isolate oomycetes from soil samples collected from fields. The purpose of this experiment was to compare different baiting techniques and selective medium to determine the best method for plant pathogen diagnostics. Soybean leaf discs, soybean seedlings, and rhododendron leaf discs were used to bait Pythium at two different time treatments, 24-hour and 72-hour post incubation (i.e., baiting). PARP (pimaricin + ampicillin + rifampicin + pentachloronitrobenzene [PCNB] + corn meal agar) and PBNIC (benlate + rovral + neomycin sulfate + chloramphenicol + PCNB + dilute V8 juice agar) selective media were used to plate leaf discs and seedlings after baiting. Plates were visually rated by counting fungal colonies produced from the baits, and the colonies were observed under the microscope to identify the presence of aseptate hyphae, oospores, and zoospores that are characteristic of oomycetes. The 72-hour time treatment resulted in a greater presence of fungal colonies than compared to the 24-hour time treatment. Additionally, the plates with PARP had more growth of Pythium cultures compared to PBNIC. It was also determined that soybean leaves baited oomycete fungi better than the rhododendron leaves or soybean seedlings. Future work will continue by creating a collection of Pythium spp. and using these isolates to evaluate seed treatments. Furthermore, the Pythium isolates will be characterized morphologically and molecularly to determine the species of each isolate.

Distribution, Abundance, and Virulence Profile of Soybean Cyst Nematode (SCN) in Ohio
Emma Newman, Zak Ralston, Dr. Anne Dorrance, and Dr. Horacio Lopez-Nicora. Department of Plant Pathology.

The soybean cyst nematode (SCN) is the most economically important pathogen of soybean in North America. SCN continues to spread throughout Ohio. Samples from 2018-2022 were submitted for testing from 60 of 88 Ohio counties. A total of 1,074 samples were tested during that time, with over 60% positive for SCN. The majority had less than 2000 eggs per/100 cm3 soil and less than 10% had more than 5000 eggs/100 cm3 soil. Soil samples that had SCN levels greater than 500 eggs/100 cm3 soil underwent SCN type testing. The SCN type testing was done on 64 SCN populations. Indicator lines used for the SCN type test were PI 548402 (Peking), PI 88788, and PI 437654, and cv. Williams82 and Lee74 were used as susceptible checks to generate the female index. Over 85% of the SCN populations that were type tested can reproduce on PI 88788 (SCN type 2) at levels between 30-60% of susceptible soybean. Peking (SCN type 1) had few populations of SCN being able to reproduce, at low levels of 10-30% of susceptible soybean. No SCN population was able to reproduce on PI 437654 higher than 10% of susceptible soybean. Of the 64 samples that were type tested 17% were SCN type 0, therefore any resistance would be effective. Additionally, soil from each field was analyzed for edaphic factors showing correlation to SCN population density for several variables. Active management of SCN begins by knowing if you have the nematode but most importantly to know your numbers.

Environmental & Plant Sciences

Using Teleconnections Data to Predict El Nino-Southern Oscillation (ENSO) Effects on Precipitation in the Midwest

Benjamin Phillips and Dr. Jim Stagge. Department of Civil, Environmental and Geodetic Engineering.

El Nino-Southern Oscillation (ENSO) is a climatic occurrence that describes the change in air and temperature pressure in the central and eastern Pacific Ocean. Changes in water temperature and air pressure cause changes to the precipitation regime of the United States. El Nino is the term used to describe low pressure and warm temperatures in the Pacific that leads to less precipitation in the northwestern US and the Midwest. La Nina is the term used to describe cold temperatures and high pressure in the Pacific that leads to more precipitation in the northwestern US and the Midwest. The purpose of this study is to identify the effect on ENSO on the precipitation regime of the Midwest using teleconnections, or indices that measure the severity of ENSO. Models were made with the variables of elevation, latitude and longitude, and a teleconnection index using the GAM method in R-Studio. The models used data from precipitation gauges in the Midwest and a 3-month grouping. The results of this study found that ENSO does in fact have an effect on precipitation in the Midwest and causes a significant amount of precipitation during La Nina and a decrease in precipitation during El Nino. The effects of ENSO were most clearly seen during the winter months, with the highest deviances explained being in the winter month groupings. The teleconnections all followed a similar pattern of deviance explained and therefore can each be used as a relatively reliable ENSO index. Further study is needed to determine if adding indices together can create more accurate models than the ones used in this study.

Determining the Sex of Date Palm, Phoenix dactylifera, using Molecular Markers

Jack Pilutti, Dr. Andrea Gschwend. Department of Horticulture and Crop Science.

Date palm, Phoenix dactylifera, is an important crop both agriculturally and horticulturally. A considerable hurdle of growing date palms is their dioecious nature. Being dioecious, pollen producing and seed producing flowers are on separate individuals. For food production, date palms are planted at a ratio of 10:1 female to male plants to optimize crop productivity. It can take five to seven years for date palms to produce flowers; which is why molecular techniques have been developed to determine the sex of date palm seedlings. Molecular markers have been identified to repeatedly and accurately determine the sex of specific date palm cultivars; however, it is still unknown if these methods can be applied to genetically distinct date palm (Intha et al., 2018). In this study, PCR was carried out using previously established date palm specific-specific primers to determine the sex of date palm seedlings from a Florida population. The results support that the sex of date palm seedlings from the Florida population can be determined using molecular markers. These findings are of great benefit agriculturally and horticulturally as it can reduce the time of sex determination from five or more years to a day in the laboratory allowing for improved breeding and biotechnology efforts.

Effect of Varying Light Treatments on Lithops Window Diameter and Color

Benjamin Stover, Dr. Uttara Samarakoon, OSU ATI Horticultural Technologies.

Lithops are small geophytic succulent plants that are endemic to the arid climates of southern Africa. Lithops capture light underneath flat translucent leaf-tips that remain flush with the ground in order to limit exposure to the stressful xeric environment in which they inhabit. They have recently become more popular as ornamental houseplants, but little is known about their optimal cultivation techniques in a commercial setting. In order to better understand optimal lighting for maximizing window diameter and controlling window color this research focused on the potential effects on lithops window appearance due to the exposure to a variety of light treatments common in commercial cultivation. The research indicated that lithops window color is highly correlated to light quality and intensity. There was some indication that light quality and intensity is correlated with window diameter, and a study with a longer duration is recommended to further examine this possibility.

Food Science (3 Projects)

Deodorization of Onion Volatiles - Research In-Progress

Joseph N. Bogdanovitch, Dr. Sheryl Barringer. Department of Food Science and Technology.

Onion volatiles create the signature aroma of onions and the lingering unwanted effect on the breath after consuming onions. Investigating the effect of various treatments on yellow onion volatile concentrations will allow for consumers to negate this undesirable effect, as well as for the possible development of commercial products for this purpose. The purpose of this ongoing study is to determine the effects of onion mass and cooking time and temperature on onion volatile concentration and to investigate the deodorization effects of various treatments on onion volatiles. Onions (*Allium cepa* L.) were peeled and chopped to approximately 1 cm cubes. 10g of onion were cooked at 50ºC for 10 minutes and treatments were applied, then onions were equilibrated in a 500-mL bottle with a septum at 40ºC for 30 minutes. Headspace volatile concentrations were measured using selected ion flow tube mass spectrometry (SIFT-MS). Variations on the amount of onion were 5, 10, 20, and 50g. Onions were cooked at 50ºC, 120ºC, or left raw. Onions were combined with 10 g of parsley or tomato paste, and 10 mL of lemon juice, water, or vinegar, or 5g of whey protein mixed with 5 mL of water. Headspace concentration of 1-propanethiol, methanethiol, dipropyl disulfide, dimethyl sulfide, and methyl propyl disulfide increased roughly linearly as onion amount increased. The headspace concentration of most volatiles decreased as cooking temperature increased due to heat destruction, while 2,5-dimethylthiophene and dimethyl sulfide increased in concentration as cooking temperature increased. Tomato paste and lemon juice are promising treatments for deodorization of onion volatiles, as these treatments decreased headspace volatile concentrations compared to the control.

Isolation of Antimicrobial-Producing Bacteria from Artisanal Cheeses and Characterization of Potentially Novel Antimicrobial Agents Produced

Gabriella Gephart, Dr. Ahmed Abdelhamid, Dr. Ahmed Yousef. Department of Food Science and Technology.

Preservatives are often used in foods to enhance the quality and safety of a product. Traditional synthetic preservatives have a largely negative consumer perception which has created a demand for natural preservatives. Some bacteria produce antimicrobial peptides that have the potential to be natural food preservatives. The purpose of this study was to isolate and identify new antimicrobial-producing bacteria from artisanal cheese and to characterize their antimicrobial agents. Artisanal cheeses were acquired from small producers in Ohio. Cheese microbiota were screened for production of antimicrobials against Listeria innocua ATCC 33090 and Escherichia coli K12 as indicator strains. The microbiota were captured on cellulose microfilters and grown on suitable agar media. The filter-colony layers were removed and the agar base was overlayed with indicator strains in soft-molten agar. Isolates that showed activity on agar media were tested against the two bacterial indicators, as well as Candida albicans SC5324, in 96 well plates using cell-free supernatant neutralized to pH 6. Isolates that showed activity were identified using 16S rRNA gene sequencing and their whole genomes were sequenced using Illumina MiSeq platform. Genome-based discovery of biosynthetic gene clusters associated with antimicrobial production was done using antiSMASH software. Results/Current Status: Cheese microbiota screening produced nine isolates with promising anti-Gram-negative and anti-Gram-positive activity. The antimicrobial-producing isolates grew optimally in MRS broth to OD600 of 1.013-1.923. Heat maps from bioassays against different targets showed diversity in antimicrobial production, indicating production of multiple compounds. Genome mining revealed 14 gene clusters, many of which encode potentially novel antimicrobial peptides, having less than 50% amino acid similarity with known bacteriocins including lactococcin, enterocin A, salivaricin, and gassericin. Conclusions: The strains studied have biosynthetic gene clusters encoding novel antimicrobial peptides that may be usable in the future for food preservation.

Food Science

***In-situ* Screening for Gluten-Free Flours Using Chemometrics and Vibrational Spectroscopy**

Cameron C. Rich, Cameron M. Jordan, Siyu Yao, and Dr. Luis Rodriguez-Saona. Department of Food Science and Technology.

Gluten refers to the glutenin and gliadin proteins found in wheat, malt, barley, and rye that improve the water absorption capacity, cohesivity, viscosity, and elasticity of wheat dough. Consumers may restrict gluten from their diet for various reasons, including celiac disease, wheat allergies, and gluten sensitivity. These safety risks are important for food companies to accurately label products as gluten-free. Gluten-free products may experience contamination during manufacturing or adulteration by product mislabeling and can pose a threat to afflicted consumers. Currently, the industry standard for quantifiable gluten detection is using the commercially available ELISA kits. While the ELISA method is easily accessible, the method is very time-consuming, laborious, and expensive. Fourier Transform Infrared (FT-IR) is a spectroscopic technique based on the interaction of infrared light with chemical components in a sample. Raman is a form of vibrational spectroscopy (VS) that is based on the nonelastic scattering of light radiation through its interaction with molecules in samples. Chemometrics allows for the dimensionality reduction of large data sets and extracts information about target molecules from complex chemical food matrices. VS with chemometrics can provide both qualitative and quantitative analyses, and is rapid, easy to use, and highly reproducible, making it a viable technique for the food industry. Our objective was to evaluate the potential for portable VS technologies to detect gluten contamination in gluten-free products. Samples of various gluten-free oat flours were spiked with wheat gluten isolate at concentrations of 500, 250, and 100 ppm. Spectra of each sample were obtained using portable FT-IR and Raman systems. Pattern recognition techniques were used to identify unique regions associated with gluten contamination. Both technologies were able to detect the presence of gluten at above 100ppm levels. The spectral fingerprinting allowed differentiation of the contaminated and non-contaminated flours. Both models were able to pick up bands associated with protein signal. In FTIR the most important bands were associated with amide II, Raman picked up signal from amide III for differentiation. Next steps will involve including samples at 20ppm and we will be using immunochemical methods to measure gluten of all samples.

Social Sciences (4 Projects)

Rural Maternal Health: An Assessment of News Frames

Samantha Graber, Dr. Cara Lawson. Department of Agricultural Communication, Education, and Leadership.

Rural maternal health care services have been disappearing leaving families at risk during pregnancy. The reduction in services is changing the way women are cared for throughout the pregnancy process. The care women once relied upon is sometimes unattainable making pregnancies less safe. To understand why this is happening we conducted a quantitative content analysis of article frames from *The Daily Yonder* in the timeframe from January 1, 2007 to February 28, 2023. *The Daily Yonder* is focused on rural America and insight to rural issues. A news frame refers to the specific way in which an issue is being conveyed to the public and provides insights to issues. We assessed 32 articles using a reliable researcher-created codebook to describe the data. We identified five frames within the dataset. The most frequently used frame was “Government Involvement/Legal,” (n = 10). The second most used frame was “Advocacy,” (n = 8). Following was “Increase in Need,” (n = 6). Next was “Economic Burden/Resource Strain,” (n = 5), followed by “Health or Medical Issues,” (n = 3). These findings suggest the issue of rural maternal health is largely an issue of government and legal issues. At the same time, the prominence of the “advocacy” frame suggests the issue is associated with people or groups supporting and promoting rural maternal care and those affected.

Social Sciences

Exploring Historical and Contemporary Relationships Between OSU and CSU
Michaela Mason, Dr. Kareem Usher, Dr. Douglas Jackson-Smith

Since 1862 Land Grant Universities (LGUs) have trained students in agricultural and mechanical sciences. In 1890 an expansion of funding established LGUs at select Historically Black Colleges and Universities (HBCU's). Ohio State University is Ohio's original LGU; Central State University, an HBCU in Ohio, did not receive funding until 2014. This study uses historical archival materials, key informant interviews, and secondary data from the USDA Census of Agriculture to examine how racial politics affected the historical evolution of and the relationship between Ohio's 1862 and 1890 LGUs. This project is ongoing, but so far, I have concluded that the 1890 legislative decision to not make Central State a LGU was shaped by covert racial politics and racial considerations and impacted the trajectory of African American farmers in Ohio. Key informant interviews will provide insight to how this trajectory is changing today.

Self-Regulated Learning Strategies Within an Online Introductory Animal Sciences Course
Elena M. McGoey, Dr. Pasha A. Lyvers Peffer. Department of Animal Sciences.

Self-regulated learning (SRL) is a cyclical and metacognitive process correlated to increased student success wherein a student plans for a task, monitors performance, and reflects on outcomes. Student use of course learning management system (LMS) features is indicative of student behaviors and SRL, which may predict course outcomes. This study analyzed student LMS access data of an asynchronous, online course (Introductory Animal Sciences) from 2019 to 2021. Page views, participations, assignment due date and relative submission, and grade data were retrieved from the LMS and de-identified. Data were compared between COVID-19 impacted terms and pre-COVID terms. Findings suggest that performance outcomes were influenced by relative assignment submission and COVID-19. Specifically, students who submitted assignments in advance of the assignment deadline showed greater overall course performance. COVID-19 negatively affected distribution of performance levels and average performance measures for individual assignment grades and overall course grades. The mean number of page views for the time periods leading up to exams were greater for students who showed exemplary performance (a score of 90% or greater) on the corresponding exam. Students with exemplary performance also had significantly greater mean total page views, resources page views, and crossword page views compared to students in the lowest performance levels. The strongest correlations were observed between exam performance and overall course grade ($r = .72$ to $.80$). Page views and optional study resources showed significant ($p < .05$) but weak correlation to exam and overall course grade. Students utilizing LMS features to promote SRL may plan to submit assignments in advance of the due date, review course material more frequently, and utilize optional study resources.

Social Sciences

Rural Ohio School Emergency Meal Distribution Plans in Response to COVID-19

Hayley F. Milliron, Dr. Amanda Bowling, and Hannah Parker. Department of Agricultural Communication, Education, and Leadership.

During the COVID-19 pandemic, rural schools in Ohio were not prepared to face the issue of food insecurity of students within their districts. The purpose of this descriptive research study was to assess rural Ohio schools, COVID-19 pandemic response in relation to emergency meal distribution and understand SES status of families in rural Ohio. A Qualtrics questionnaire of closed- and open-ended questions addressed the research objectives surrounding the following areas: (1) describe school meals provided pre-COVID and post-COVID, (2) describe schools emergency meal distribution plan, and (3) describe the average SES status of family household level. To answer the research questions, we collected and analyzed data surrounding self-reported measures of meals provided by schools, how often they were provided and the average income of families in rural Ohio by administrators (n = 15). Participates reported an increase in meals provided (n = 13) after the start of the COVID-19 pandemic as compared to before March 2020 (n = 11). Meal delivery methods varied among participants from meal pick up at school (n = 4) or community building (n = 1) to delivery to students' homes (n = 1) to both pick and delivery options (n = 2). Most schools reported an SES status of the middle class or lower among families within their school district. Findings suggest that schools during the COVID-19 pandemic increased the frequency of meals provided as compared to before the COVID-19 pandemic. After the end of the 2020 school year, the frequency of meals decreased compared to the emergency response between March 2020 and the end of summer 2020. Furthermore, many of the schools increased the types of meals distributed (breakfast, lunch, and snacks) frequency of distribution, and methods of distribution to families. Recommendations for rural Ohio schools include evaluating their current emergency food distribution system and consulting experts to prepare for future emergencies. Recommendations for future research include qualitative methods to explore why the school chose specific meal distribution methods. Lastly, future research should explore the status of meal distribution plans of schools in rural Ohio to prepare proactively rather than reactively.