



THE OHIO STATE UNIVERSITY

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COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

19<sup>th</sup> Annual  
Undergraduate Research Forum

Tuesday, April 12, 2022  
1:00 – 3:00 p.m.

Nationwide and Ohio Farm Bureau 4-H  
Center

**2022 CFAES Undergraduate Research Forum**  
**Tuesday, April 12, 2022**

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# Judges

Dr. Sheryl Barringer (Department of Food Science and Technology)  
Schelby Beach (Department of Agricultural Communication, Education, and Leadership)  
Dr. Nora Bello (Department of Animal Sciences)  
Dr. Joshua Blakeslee (Department of Horticulture and Crop Science)  
Patricia Boley (Department of Animal Sciences)  
Dr. Amanda Bowling (Department of Agricultural Communication, Education, and Leadership)  
Dr. Wanderson Bucker Moraes (Department of Plant Pathology)  
Dr. Sisi Cao (College of Education and Human Ecology)  
Dr. Ana Carranza Martin (Department of Animal Sciences)  
Dr. Cecilia Chagas de Freitas (Department of Plant Pathology)  
Dr. Kellie Claflin (Department of Agricultural Communication, Education, and Leadership)  
Dr. Katrina Cornish (Department of Horticulture and Crop Science)  
Benjamin Duran (Department of Animal Sciences)  
Jennifer Eggleton (Department of Agricultural Communication, Education, and Leadership)  
Dr. Thaddeus Ezeji (Department of Animal Sciences)  
Dr. Colby Gregg (Department of Agricultural Communication, Education, and Leadership)  
Lucy Guarnieri (Department of Entomology)  
Dr. Francesa Hand (Department of Plant Pathology)  
Demilade Ibiwoye (Department of Animal Sciences)  
Khandakar Islam (CFAES-South Centers at Piketon)  
Dr. Reed Johnson (Department of Entomology)  
Dr. Wendy Klooster (Department of Horticulture and Crop Science)  
Rafael Landaverde (Department of Agricultural Communication, Education, and Leadership)  
Dr. Ashley Leach (Department of Entomology)  
Dr. Margaret Lewis (Department of Entomology)  
Dr. Alex Lindsey (Department of Horticulture and Crop Science)  
Jaelene Loor Suche (Department of Agricultural Communication, Education, and Leadership)  
Ashish Manandhar (Department of Food, Agricultural, and Biological Engineering)  
Dr. Kristin Mercer (Department of Horticulture and Crop Science)

# Judges

Dr. Megan Meuti (Department of Entomology)

Dr. Fred Michel (Department of Food, Agricultural, and Biological Engineering)

Dr. Gonzalo Miyagusuku Cruzado (Department of Food Science and Technology)

Dr. Jin Hong Mok (Department of Food, Agricultural, and Biological Engineering)

Dr. Ali Nazmi (Department of Animal Sciences)

Kayla Oberstadt (OSU Extension)

Dr. Osler Ortez (Department of Horticulture and Crop Science)

Hannah Parker (Department of Agricultural Communication, Education, and Leadership)

Dr. Vitor Pavinato (Department of Entomology)

Dr. Jo Peacock (School of Environment and Natural Resources)

Dr. Benjamin Philip (Department of Entomology)

Dr. Lauren Pintor (School of Environment and Natural Resources)

Dr. Zoe Plakias (Department of Agricultural, Environmental, and Development Economics)

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

Dr. Mary Pohlschneider (Department of Food Science and Technology)

Dr. Joe Raczkowski (Department of Entomology)

Timothy Ralston (Department of Plant Pathology)

Ruifan Ren (Department of Plant Pathology)

Dylan Ricke (Department of Entomology)

Brandon Shannon (Department of Entomology)

Elizabeth Share (Department of Animal Sciences)

Susan Shickley (OSU Extension)

Fenfeng Tang (Department of Food, Agricultural, and Biological Engineering)

Matt Teegarden (OSU Office of Research)

Ana Maria Velasquez Giraldo (Department of Food, Agricultural, and Biological Engineering)

Dr. Quihong Wang (Department of Animal Sciences)

Dr. Shannon Washburn (Department of Agricultural Communication, Education, and Leadership)

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

Dr. Bain Wilson (Department of Animal Sciences)

Yu-Lun Wu (Department of Agricultural Communication, Education, and Leadership)

Dr. Ye Xia (Department of Plant Pathology)

## Animal Sciences – Animal Health (11 Projects)

### **Accelerometer Use for Activity Monitoring in Horses by Determining Step Counts at Different Gaits**

Kallie Allen. Alora Brown. Dr. S.L Mastellar. OSU ATI

Uses of accelerometers in animal science include activity tracking, gait identification, and lameness detection. Previous studies in horses using HOB0 Pendant G Data Logger accelerometers focused on quantifying lying time and time resting a hindlimb. In this study, ten horses (15±2 yrs) familiar with round-pen work, wearing splint boots, and surcingles were used. Horses were weighed on a livestock scale, measured at the withers for height using a height stick, and the length of their front cannon bones were measured with a measuring tape. Each horse was fitted with a heartrate monitor around their heartgirth and splint boots around each front cannon. A cell phone holder was attached to the outside of the left splint boot to house the accelerometer set to record at 50 Hertz. In the round-pen each horse was videoed at each gait (walk, trot, and canter) in each direction. Data from the cameras, heartrate monitors, and accelerometers were collected, synced, and evaluated. Steps were manually counted by watching video clips. To automatically estimate step counts using the accelerometer data the following actions were taken. First, the absolute value of accelerations on all three axes were summed. Peaks of the summed accelerations were considered to indicate steps. As the height of the peaks varied between horses, measurements were considered to indicate peaks when they were at or above the 98.7th, 98.4th, and 98.4th, percentile of summed accelerations for that horse during the walk, trot, and canter, respectively. Step counts from the accelerometer data were then compared to step counts from the video clips. The horses weighed 574±13 kg, were 156±2 cm tall, and had cannon lengths of 27±0.4 cm. Heartrates in beats per min were typically lower during the first direction traveled (walk 57±8, trot 66±11, and canter 76±14) which was the left as compared to the right (walk 96±15, trot 95±19, and canter 105±19). The accelerometer predicted step counts were 101±6%, 99±10%, and 103±9% of the step counts as determined from video footage at the walk, trot, and canter, respectively. This method of activity monitoring has the potential to help estimate activity in future equine studies.

### **Evaluation of a Soy-Biochar Granular Litter Amendment for Broiler Production**

Emily Benton. Paige Doklovic. Dr. Michael Cressman. Department of Animal Sciences

One of the main concerns in commercial broiler chicken production is litter quality, as birds spend their lives in contact with it. Issues arise when, over time, litter quality deteriorates, as elevated levels of litter moisture can cause contact dermatitis on the breast, feet, and hocks of birds. Litter of poor quality may also emit high levels of ammonia which have been shown to cause irritation and damage to mucus membranes, such as the respiratory tract and eyes, in both birds and people. Therefore, the objective of this study was to evaluate a novel soy-biochar granular litter amendment for broiler production on litter quality, air quality, bird growth performance, and bird welfare. Twelve floor pens (3.25 m<sup>2</sup>) were each bedded with an 18 kg mixture of hardwood sawdust and softwood shavings. Thirty commercial broiler chicks were placed in each pen, and pens were randomly assigned to one of four treatments: 0, 2.5, 5, and 10 percent (w/w) inclusion of a novel soy-biochar litter amendment. Throughout the 47-day study, samples were collected weekly and measured to determine litter quality (*e.g.*, pH, percent moisture, and percent total N); air ammonia concentrations; and bird growth performance (*e.g.*, live body weight and feed intake). At the end of the study, footpad health and breast feather condition and cleanliness were scored to assess bird welfare. Inclusion of the litter amendment did not impact final live bodyweight or bird welfare measures. Litter amendment made no impact on litter chemistry (*e.g.*, pH, percent total nitrogen, and percent carbon) and percent moisture; however, there was a significant impact on litter chemistry and percent moisture over time ( $p<0.05$ ). Air quality was impacted due to the presence and quantity of litter amendment ( $p<0.05$ ). As time increases, air quality, as measured by ammonia flux (mg m<sup>-2</sup> min<sup>-1</sup>), decreases. This was determined to be significant by treatment, as an inclusion level of 10% resulted in a higher litter ammonia flux measurement during the last two weeks of treatment ( $p<0.05$ ).

## **Animal Sciences – Animal Health**

### **Prevalence of Influenza A Virus in Exhibition Swine and Youth Exhibitors at The Exposition Swine Show in Indiana, 2021**

Amber T. Cleggett, Devra, D. Huey, Andrew S. Bowman, and Jacqueline M. Nolting OSU Veterinary Medicine

Swine infected with influenza A virus (IAV) pose a threat to public health, particularly at the human- animal interface. Over 480 cases of youth infected with swine-lineage IAV associated with agricultural fairs have been reported over the past decade. To this end, nasal samples from exhibition swine and youth exhibitors were collected at a national swine show to estimate prevalence of IAV in both hosts. Based on historical data collected from this show, it is hypothesized that the estimated IAV prevalence in exhibition swine will be 30.4% and the estimated prevalence of IAV in youth will be less than 1%. Molecular testing revealed 11% of the swine were infected with influenza, with H3N2 being the dominant subtype. Statistical analysis revealed that the estimate IAV prevalence in exhibition swine this year is significantly different than the average estimate IAV prevalence for this show over the past five years, thus, this hypothesis was not supported. Active influenza infections were not detected in youth; however, surveillance needs to be continued at this important interface to gain understanding in IAV transmission across the species barrier.

### **Characteristics of Small Antral Follicles in Heifers Carrying the Bovine High Fecundity Allele Trio**

Cassidy L. Ficker, Dr. Ana C. Carranza, Dr. Alvaro Garcia-Guerra, Department of Animal Sciences.

Trio, a bovine high fecundity allele, results in ovarian follicles that develop at a slower rate, acquire ovulatory capacity at smaller sizes, and have a 3-fold greater ovulation rate. Presence of the Trio allele results in increased abundance of SMAD6 protein, an inhibitor of BMP15 which stimulates proliferation of granulosa cells, the main cellular component of ovarian follicles. Results from recent research indicate that, after primordial follicle activation, follicles in Trio carriers have slower progression through the primary stage and, as a result, a larger oocyte. There is, however, a lack of information on the effect of the Trio allele on small antral follicles. Thus, the objective of the present study was to compare the morphological characteristics of small antral follicles of Trio carrier and non-carrier cattle. Ovarian tissue (1x1 cm) from Trio carrier (n=9) and non-carrier heifers (n=6) was collected, fixed, and embedded in paraffin. Six sections of each ovary were stained with hematoxylin-eosin and evaluated under a bright field microscope. Small antral follicles (<1mm) which presented a clearly defined antrum and for which the oocyte was visualized were imaged. For each follicle the area of the follicle, oocyte, antrum, and granulosa cell layer was determined using Image J. Differences between genotypes were assessed by t-test or Wilcoxon's rank test. A total of 22 and 8 small antral follicles were identified from carrier and non-carrier heifers, respectively. Total follicle area was not different ( $P=0.56$ ) between Trio carrier ( $181,522\pm 24,963 \mu\text{m}^2$ ) and non-carrier ( $209,295\pm 35,429 \mu\text{m}^2$ ) follicles. Similarly, there were no differences ( $P>0.3$ ) in granulosa cell layer area ( $130,614\pm 13,039 \mu\text{m}^2$ ), antrum area ( $50,314\pm 7,677 \mu\text{m}^2$ ), or oocyte area ( $8,000\pm 610 \mu\text{m}^2$ ) between Trio carrier and non-carrier follicles. The percentage of the total follicle area occupied by the antrum ( $22.8\% \pm 1.6$ ) or the granulosa cell layer ( $71.5\% \pm 1.3$ ) was not different ( $P>0.20$ ). There was, however, a tendency ( $P=0.07$ ) for the oocyte to occupy a larger percentage of the follicle area in Trio carrier ( $6.3\% \pm 0.8$ ) than non-carrier ( $4.1\% \pm 0.6$ ) follicles. The knowledge gained from this research can ultimately aid in the development of strategies to mitigate the occurrence of multiple births an undesirable outcome in cattle.

## **Animal Sciences – Animal Health**

### **The Effect of Temperament and Social Status on Responses to Predator Cues in Domestic Horses**

Rachel Hofacker and Zeynep Benderlioglu. Evolution Ecology and Organismal Biology.

Acoustic, olfactory, and visual predator cues trigger various adaptive responses among a variety of prey species even when they are under human protection since birth. Previous studies have found that domesticated animals show increased vigilance, stress, flight, and aggregation behaviors in response to predation threats. These investigations, however, did not directly test visual threatening cues alone in animals that communicate more with body language than vocalizations while considering individual temperament and social rank. The current study aims to address this issue. Twenty-seven horses housed at the OSU Equine Center with mixed age and sex were subjects of this project. The horses were shown predator interactions on a projector without any acoustic cues while their reactions were recorded with an equine heart monitor. Staff ratings on anxiety/fear, social dependency, and rank status in the herd were subsequently collected through care-taker surveys. Results show that domestic horses were able to distinguish an unfamiliar predator from an unfamiliar non-predator based on visual cues alone as measured by physiological and behavioral stress responses towards the unfamiliar predator stimulus. Young horses were more fearful than the old ones. Male horses showed more physiological stress response to unfamiliar predator cues compared to the females. Social rank was unrelated to fearfulness, social dependency, age, and sex. This project may help elucidate innate vs. learned behaviors that can be expanded to different taxa. Moreover, the results may have important implications for horse-human interactions. Domestic horses are kept for a variety of reasons, including recreation and sports, human comfort and companionship, crowd control, search and rescue operations, breeding, training, and education. The assessments on temperament, and fear responses to potentially threatening stimuli have direct relevance to horse welfare and effectively communicating human signals.

### **Effect of Myostatin Gene Knockout on Bone Properties within Quail**

Madeline Karolak, Joonbum Lee, Dong Hwan Kim, Dr. Benjamin Bohrer, Woo Kim, Dr. Kichoon Lee. Department of Animal Sciences.

The Myostatin (MSTN) gene has proven contributions to body composition that can be seen in naturally occurring variant animal and human models. Within the avian model, knocking out MSTN through genome editing with the CRISPR/Cas9 system demonstrates increased growth with increased muscling and decreased adipose proportion. Another tissue within the body, bone is significant within the avian model for its unique hollowness enabling flight. The objective of this study is to investigate how knocking out MSTN affects bone properties including length, whole diaphysis bone mineral content (BMC), bone mineral density (BMD), and bone volume (BV) within the avian model. Groups of wildtype and knockout male Japanese Quail were raised simultaneously, culled once mature at 4 months old, and the humerus, femur, and tibia were obtained. Using a TA.XT Plus 100 C Texture Analyzer and 3-point contact system, the bones were broken, and the weight applied until breaking was measured. Averages and P-values were calculated to demonstrate that knockout quail had significantly and consistently stronger bones than their wildtype counterparts. Further investigation was completed to understand the specific differences between the bones of each group. Using Micro-Computed Tomography (micro-CT) scanning and SkyScan 1172 software, several aspects of the bones were obtained, including length, BMV, BMD, and BV, among other traits. These aspects are intrinsically linked with bone strength and demonstrated significant differences between the wildtype and knockout group, namely that the knockout group bones were consistently longer and had higher BMV, BMD, and BV. These findings can be used to select for natural variants in the poultry population that have low MSTN activity, meaning that these individuals will have stronger bones and increased growth, though not to the extent as shown when inactivating the gene. While genome edited organisms (GEO) are subject to scrutiny in the public eye, many altered organisms have already passed public perception to end up on our plates, namely in the form of fruits, vegetables, and salmon. Overall, these findings can result in significant earnings for poultry producers who will have stronger, heavier birds.

## **Animal Sciences – Animal Health**

### **Impact of the COVID-19 Pandemic on Influenza A Virus in Exhibition Swine 2019-2021**

Avery B. Lawrence, Dillon S. McBride, Jacqueline M. Nolting, Andrew S. Bowman

Influenza A virus (IAV) is a rapidly spreading zoonotic disease that causes infections in a variety of species. Exhibition swine are the primary human animal interface of zoonotic IAV in the US, playing a significant role in its spread and dissemination. While the 2019 show season was unaffected by the COVID-19 outbreak, both the 2020 and 2021 seasons were impacted by travel restrictions, gathering limitations, and quarantines due to the COVID-19 pandemic. We investigated how the effects of the COVID-19 pandemic influenced the spread and evolution of IAV, hypothesizing that compared to prior years, there would be fewer variants of IAV in exhibition swine. We collected over 14,000 nasal samples from 8 states from swine at county fairs and national jackpot shows from 2019-2021. We tested samples for IAV via reverse transcriptase real time PCR, resulting in 1,008 PCR positives. The prevalence of PCR positive IAV per year is: 6.58% in 2019, 8.05% in 2020 and 6.56% in 2021. We attempted full genome sequencing on the positive samples, yielding 298 successful sequences. We inferred evolutionary relationships and geographic dispersion of IAVs using maximum likelihood and Bayesian phylogenetic methods. The primary subtype sequences are: H3N2, H1N2, H1N1 with pdm and TRIG, and in 2021, evidence of live attenuated influenza vaccine virus (LAIV) was found. Using Simpson's Index of Diversity, 2020 had the most rRT-PCR positives, but least diversity of 0.2188. 2021 was the most diverse with an index of 0.6614. A prior study found there to be over 15% rRT-PCR IAV positives in 2018, with a ~9% drop into 2019, however, the case count remained low in the following years instead of rebounding as it historically does. Additionally, as stated in another study, 2018 also had more subtypes, but less diversity, similar to 2020. Overall, the pandemic has provided insight into how quarantines and other restrictions can help control zoonotic influenza and spill over for future IAV outbreaks.

### **Synthesis and Screening of Phenol Substituted Quinone Methide Precursors as Potential Resurrecting Agents for Aged Acetylcholinesterase**

Hailey G Main. Christopher T Codogni. Anne Buck. Rose Homoele. Christopher M. Hadad. Dr. Christopher S. Callam Chemistry and Biochemistry.

The primary objective of this project is to identify organic compounds that have the potential to reverse the effects of organophosphorus (OP) chemical nerve agents and pesticides in the central and peripheral nervous system after exposure. OP pesticide exposure kills more than 200,000 people every year. This is due to the inhibition of acetylcholinesterase (AChE) which breaks down the neurotransmitter acetylcholine to choline and acetate. The inhibition of AChE leads to a buildup of acetylcholine in the body and causes severe symptoms and eventually death if not treated immediately. Current treatments that exist to counteract the effects of exposure are only capable of reactivating the inhibited form of AChE to its native form. No current treatment options can resurrect the aged form of AChE to its native form. Our lab is the first to develop libraries of molecules with resurrection capabilities. The proposed libraries of compounds also showed reactivation capabilities. This is important because it implies that the same compound can be used on both the inhibited and the aged forms of AChE. Many different compounds with frameworks built around aromatic rings with varying functional groups are continuously being synthesized and tested for selective resurrection capabilities. Modification of these substituents allows us to further analyze both electronic and steric interactions the compounds have on the active site and the mode of action. We have developed the synthesis of large libraries of chemical compounds that are predicted to have potential resurrection capabilities. This poster will explore the reactions to synthesize each compound, the purification techniques to isolate the compounds, and characterization methods. We will also share preliminary biochemical studies towards resurrection and reactivation capabilities.

## **Animal Sciences – Animal Health**

### **Determination of the Mitotic Interval (tau) in Zebrafish Embryos**

Airianna McGuire. Mackenzie Miller. Dr. Konrad Dabrowski. School of Environment and Natural Resources.

This project aims to calculate tau over a range of physiologically acceptable temperatures for zebrafish (*Danio rerio*) as well as evaluate the effect of temperature on embryonic developmental rate. As a model species, the development of mechanisms and techniques to determine tau can be applied to other species that are either valuable to research or are valuable to the commercial aquaculture industry. Since determining tau is a novel concept to zebrafish, this research intends to determine tau over a wide range of temperatures and use multiple strains of zebrafish to gain a greater understanding of embryonic development rate in a model vertebrate. Using different strains will allow a greater understanding of physiological differences among different genotypes in relation to temperature and development. An understanding of tau in zebrafish can be applied to future chromosome manipulation studies. Therefore, this project aims to use a temperature range of 22°C to 31.5°C using both the Casper and Red strains of zebrafish. Embryos are sampled to a fixative at specified time intervals during development, enabling the microscopic assessment of embryonic development. During assessment, the number of embryos at cell stages 1-cell to 16-cell are counted at each time interval, and the time at which 10% of embryos reach the 2-cell and the 8-cell stage is recorded and used to calculate the tau value. While the experiment is not complete, thus far it has been observed that as temperature increases, the rate of embryonic development increases. Further, it has been determined that the upper thermal limit of zebrafish is around 31.5°C.

### **Effect of Endometrial Area on Reproductive Performance of Embryo Transfer Recipient Dairy Heifers**

Elizabeth M. Ohl. Jessica C.L. Motta. Eber J. Canadas. Benjamin J. Duran. Cameron Hayden. Rodrigo V. Sala. Victor A. Victor A. Absalón-Medina. Dr. Alvaro Garcia-Guerra. Department of Animal Sciences.

Fertility and pregnancy success after embryo transfer (ET) in cattle is greatly influenced by the uterine environment. Endometrial area (EA) can be easily determined using transrectal ultrasonography and varies significantly throughout the estrous cycle in response to changes in circulating steroid hormone concentrations. For example, decreased EA is associated with high circulating progesterone (P4) and low estradiol concentrations. Progesterone produced by the corpus luteum (CL) is critical for embryo development, thus elevated P4 at the time of ET is positively associated with fertility. There is, however, a lack of information on the effect of EA on fertility in ET recipient heifers. The objective of this study was to investigate the relationship between EA and reproductive performance of ET recipient heifers. A total of 245 dairy heifers were synchronized using a modified 5-day CO-Synch protocol as follows: D-8: an intravaginal P4 implant (CIDR®, 1.38 g P4) was inserted; D-3: CIDR® was removed followed by administration of prostaglandin F2 $\alpha$  analog (PGF; 500  $\mu$ g cloprostenol); D0: administration of GnRH (100  $\mu$ g gonadorelin). On D-3, all heifers received an estrous detection patch, which was evaluated for evidence of mounting activity on D0. On D5, the presence and size of the CL and EA were determined using ultrasonography. On D7 $\pm$ 1, heifers with a CL received an embryo, and pregnancy was determined using ultrasonography 30 and 60 days after GnRH. Heifers were classified into Small (154.8 $\pm$ 2.0 mm<sup>2</sup>; n=81), Medium (195.4 $\pm$ 1. mm<sup>2</sup>; n=82) and Large (250.2 $\pm$ 3.9 mm<sup>2</sup>; n=82) EA based on tercile distribution. Data were analyzed using generalized linear mixed models. Serum progesterone (P4) concentration was different (P=0.03) among EA size groups, where heifers with Small EA had greater serum P4 (2.3 $\pm$ 0.2 ng/ml) than those with Large (1.7 $\pm$ 0.1 ng/ml) EA, while heifers with Medium (2.0 $\pm$ 0.1 ng/ml) EA were intermediate. Similarly, heifers with Small and Medium EA had greater (P=0.03) CL volume than heifers with Large EA. However, estrous expression, utilization rate (transferred/treated), pregnancies per embryo transfer (P/ET), and pregnancy loss were not different (P>0.10) between heifers with Small, Medium, or Large EA. In conclusion, the EA of heifers at D5 did not affect pregnancy success.

## **Animal Sciences – Animal Health**

### **Effects of Different Genres of Music on Milk Yield, Milking Time, and Behavior of Dairy Cows**

Madison Pinkerton. Zach England. Dr. Jess Pempek. Department of Animal Sciences.

Animal welfare research can influence practice by identifying how animal welfare is influenced by specific environmental conditions and management procedures. Studies investigating the potential beneficial effects of music on dairy cattle have mostly been limited to classical music, and further work is needed to identify how other genres influence cattle welfare. The aim of this crossover study was to explore the effects of different genres of music on cows' milk yield, milking time, and behavior during milking. Ninety-one Jersey cows were introduced to different genres of music, including Latin, country, classical, rock, and no music (control), in the milking parlor. Cows were exposed to a different genre of music or the control over four 5-day periods, whereby one genre of music was played during each milking. Milk yield and milking time were recorded for all cows. Cows' behavior during milking was video recorded, and later assessed for a subset of cows ( $n = 38$ ) by scoring flinch, step, and kick (FSK) responses during cluster attachment. Milk yield increased ( $P < 0.05$ ) by 0.51 kg, 0.42 kg, 0.32 kg, and 0.23 kg when classical music was played, compared to no music (control) and country, Latin, and rock music genres, respectively. Comparatively, milk yield decreased by 0.19 kg and 0.29 kg when no music was played in the parlor compared to Latin ( $P = 0.0304$ ) or rock ( $P = 0.0011$ ) music, respectively. Statistically significant differences of 9.6 seconds or less in milking time existed when comparing classical music to the control and Latin music, and the control to country and rock ( $P < 0.05$ ). Music did not influence cows' FSK responses during cluster attachment. This study indicates certain genres of music, particularly classical music, increased milk production, which indicates potential benefits to animal welfare and herd profitability over time. Other aspects of behavior, including the total number of FSK responses should be considered during udder washing, cluster attachment, cluster removal, and anti-septic washing should be considered in future studies, as well as the cows' response to music played in different environments, such as loose housing and across larger herds, in future studies.

## **Animal Sciences – Nutrition (4 Projects)**

### **Considerations for Color Coding Treatments in Equine Nutrition Studies**

Alora Brown. Kallie Allen. Dr. S. L. Mastellar. OSU ATI

Colored buckets are used by owners and nutritionists for color coding as this can reduce the potential for mistakes. When using colored buckets for research, it is important to know whether colors bias results. Horses have dichromatic vision; which limits equine color perception. Additionally, bucket color can affect the absorption of solar radiation and temperature of the contents ( $P < 0.0001$ ) as determined in our pilot study. To test if horses have color preferences, two trials were conducted. In the first trial, 32 horses were stalled overnight with access to eight different colored buckets each containing 4000 g of water. In the second, eight horses were used eight times with the colored buckets in a different order each time. Each bucket contained ~55 g of chopped hay. Four of the horses had been used for preference testing 10 months prior with the same set of buckets. These horses were included to determine if they had retained their previous preference. The horses were fasted for 20 min prior to preference testing for 20 mins. The amount consumed and first choice were recorded in both trials. We found in the first trial that color had no effect on water consumption ( $P > 0.05$ ). However, bucket location had an effect ( $P = 0.03$ ), with buckets closer to the stall door being selected more. For the feed trials neither order nor color had an effect on hay consumption ( $P > 0.05$ ). As a population, the horses previously used in preference testing did not have first choices statistically different than the naive horses ( $P = 0.78$ ) or chance ( $P = 0.86$ ). However, one outlier horse did tend to have a different first choice frequency ( $P = 0.051$ ), but did not consume more from his first choice buckets. These findings support the use of color coded treatments in nutrition research, especially when conducted out of direct sunlight. Colored bucket preference of owners and managers should not affect equine consumption indoors.

## Animal Sciences – Nutrition

### ***Pediococcus acidilactici* Inhibits Enterotoxigenic Escherichia coli (F4+) K88 Adhesion to Porcine IPEC-J2 Intestinal Cells but do not Protect Paracellular Epithelial Permeability**

Elizabeth Due, Claudia Tellman, Rui Zheng, Dr. Sheila K. Jacobi, Department of Animal Sciences.

**Background:** Gastrointestinal (GI) health is a major component of proper digestion and absorption of dietary nutrients. Weaning causes multiple stressors that contribute to impairment of the GI health and epithelial barrier. Probiotics may be an alternative to in-feed antibiotics to optimize GI health and performance. The objective of this study was to investigate the ability of *Pediococcus acidilactici* (PA) to improve adhere to intestinal epithelial cells, reduce enterotoxigenic *E. coli* (ETEC) attachment, and reduce epithelial cell cytotoxicity and epithelial barrier permeability. **Methods:** IPEC-J2 cells were seeded at a concentration of  $1 \times 10^5$  cells/well, grown to confluence, and treated with PA for 3 h at concentrations of  $10^8$ ,  $10^9$ ,  $10^{10}$ , and  $10^{11}$  colony forming units (CFU)/mL. Bacterial adherence assays were performed to determine probiotic CFU adhered to the cells. To assess probiotic inhibition of ETEC adherence, cells were treated with probiotics at previously defined concentrations and ETEC (multiplicity of infection 2:1) for 2 h. Following incubation ETEC adherence assays were conducted. Cell cytotoxicity was assessed by lactate dehydrogenase (LDH), and paracellular permeability was measured using 4-kDa fluorescein isothiocyanate-dextran (FITC-dextran). **Results:** Data showed there was a positive linear relationship of PA adherence with increasing concentrations of  $10^8$ ,  $10^9$ ,  $10^{10}$  and  $10^{11}$  CFU/mL ( $5.05$ ,  $6.03$ ,  $6.96$ ,  $7.67 \pm 0.08 \log_{10}$  CFU/cm<sup>2</sup>,  $P < 0.01$ ). Inhibitions of ETEC adherence by PA showed reduced pathogen adhesion inversely related to increased probiotic concentrations of  $10^8$ ,  $10^9$ ,  $10^{10}$  and  $10^{11}$  CFU/mL ( $23.49$ ,  $31.48$ ,  $4.59$ ,  $0.17 \pm 6.85$  % of control,  $P < 0.01$ ). The presence of PA in culture modulated cellular cytotoxicity of IPEC-J2 cells exposed to ETEC ( $P < 0.05$ ) but did not protect against intestinal barrier permeability ( $P > 0.05$ ). **Conclusions:** In conclusion, increasing concentrations of PA showed increased adherence to IPEC-J2 cells, supplementation of PA decreased adherence of ETEC to IPEC-J2 cells and modulated cellular cytotoxicity.

### **Evaluating the Effect of Maternal Gestation Diet, Differing in Type and Amount of Fiber, on Ewe and Offspring Body Weight and Feed Intake**

Kara E. Flaherty, Dr. Braden J. Campbell, Dr. Alejandro E. Relling, Department of Animal Sciences.

The objective of this experiment was to evaluate the effect of feeding different types and amount of fiber during gestation on ewe body weight (BW) and dry matter intake (DMI), and lamb BW at birth, weaning, and finishing and DMI at finishing. Ninety Dorset x Hampshire ewes were blocked by BW and randomly assigned to one of three treatments (3 pens/treatment; 10 ewes/pen): ad-libitum hay (CONT), limit-fed hay (LH), and soybean hulls (SH). The concentrate roughage ratio for the LH and SH diets was 1:3. From d0 (28 days post mating) to d63, LH and SH ewes were fed using slick bunk management. Ewes in the CONT diet were offered an equal amount of concentrate as LH ewes with ad-libitum access to hay. On d63 ewes were offered the same diet to meet, but not exceed, maintenance requirements for late-gestation. Feed offered and refused were collected daily for LH and SH ewes whereas hay refusal was collected weekly for CONT ewes. Ewe BW was collected on days 28, 34, 76, and two-days after lambing. Fifty-five whether lambs were blocked by BW and day of lambing and allocated into 18 pens (6 pens/treatment; 3-4 lambs/pen). Lamb BW was collected at birth, weaning, and finishing, and DMI was collected during finishing. Data, presented in Table 1, were analyzed as a mixed model considering the fixed effect of treatment and random effects of ewe or lamb (pen), pen, and block. Ewe dry matter intake was similar the first 28 days ( $P = 0.13$ ), however, SH ewes consumed more by d62 ( $P = 0.02$ ). As DMI increased, SH ewe's BW also increased during gestation ( $P \leq 0.01$ ) but was similar two-days after lambing ( $P = 0.21$ ). Lambs born of SH ewes were heavier at birth, but lighter at weaning ( $P \leq 0.02$ ). There was no difference during finishing on lamb BW ( $P = 0.65$ ), DMI ( $P = 0.54$ ), ADG ( $P = 0.48$ ), or G:F/feed efficiency ( $P = 0.48$ ). Despite each diet having the same forage to concentrate ratio, forage source affected ewe BW during gestation and lamb BW at birth and weaning. Feeding hay ad-libitum or in a controlled manner did not change ewe or lamb BW.

## **Animal Sciences – Nutrition**

### **Effects of Dietary Conditions on Branched-Chain Fatty Acid and Aldehyde Synthesis in Dual Flow Cultures**

S.L. Kienzle, K.E. Mitchell, C. Lee, Dr. J.L. Firkins. The Ohio State University Department of Animal Sciences

Cellulolytic bacteria synthesize branched-chain fatty acids (BCFA) and aldehydes (BCALD), which are vital to cell membrane structure. Our objective was to evaluate changes in BCFA and BCALD production in continuous cultures under varying dietary conditions. We hypothesized that 1) low forage (LF) in the diet would decrease BCFA and BCALD synthesis by lowering abundance of cellulolytic bacteria; 2) adding corn oil (CO) would inhibit cellulolytics and thereby decrease BCFA or BCALD concentrations; and 3) supplemental BCVFA would alleviate adverse effects of CO, recovering BCFA and BCALD production. The study was an incomplete block design with 8 continuous cultures used in 4 periods with treatments (n=4) arranged as a 2x2x2 factorial. The factors were: high forage (HF) or LF (67 or 33% forage), without or with supplemental CO (3% dry matter intake, 1.5% polyunsaturated fatty acids), and without or with 2.15 mmol/d each of isovalerate, isobutyrate, and 2-methylbutyrate. Bacterial fatty acids and aldehydes were methylated, separated by thin-layer chromatography, and analyzed by gas chromatography. A mixed model had the random effects of period and fermenter and fixed effects of diet, CO, BCVFA, and their interactions. Overall BCFA and BCALD flows (mg/d) did not change ( $P>0.12$ ) with any main effects but shifts in the profiles (% of respective totals) will be discussed hereafter. Total BCFA profile decreased ( $P<0.01$ ) by 25.3% with LF compared to HF. In contrast, 18:1 FA isomers increased ( $P<0.01$ ) by 26.3% with LF vs HF. Supplemental CO and BCVFA also increased ( $P<0.01$ ) 18:1 FA isomers by 25.6% and 15.4%, respectively. Iso even BCFA and BCALD were decreased ( $P=0.10$ , 16.4%) and ( $P=0.03$ , 8.2%), respectively, signifying CO inhibits iso even BCFA and BCALD incorporation into cell membranes. Iso odd BCALD decreased ( $P<0.01$ ) with LF vs HF by 23.7%, but there were no changes ( $P>0.20$ ) in anteiso BCALD, signifying their importance in membrane physiology despite dramatic dietary shifts and changes in bacterial populations. Increased transfer of 18:1 FA isomers with the addition of LF, CO, and BCVFA suggests coordinated responses of BCFA and especially BCALD in plasmalogens to maintain membrane fluidity and therefore optimum fiber degradation and feed efficiency.

## **Entomology (2 Projects)**

### **Assessing the Importance of Goldenrod Nectar for Honey Bee Colony Health and Survival**

Isabel S. Nazarian. Harper McMinn-Sauder. Dr. Reed Johnson. Department of Entomology.

For honey bees (*Apis mellifera*) and many other pollinating insects, fall is the last opportunity to gather the resources needed to make it through the winter. Goldenrod bloom offers a large and consistent source of pollen and nectar. I hypothesized that honey bee colonies with access to abundant goldenrod flowers would lose less weight, representing reduces utilization of honey stored earlier in the year, than colonies without access to abundant goldenrod. I also hypothesized that, due to the nutrition provided by goldenrod, as colonies were entering the winter months, colonies near abundant goldenrod would have a better rate of survival over winter. To test these hypotheses two main variables were measured at regular intervals: the quantity of goldenrod bloom and colony weight. Two locations were chosen, both in agricultural landscapes. Colonies at one apiary had access to land enrolled in the Conservation Reserve Program, which included dense stands of goldenrod (*Solidago*) in late summer. Goldenrod abundance was measured by performing vegetation surveys of the sites biweekly. Colony weight data was collected every hour with automated scales on the hives in each apiary. The floral origin of nectar was identified using light microscopy to identify residual pollen in nectar samples. In the spring, all colonies were checked for health and survival. Results indicate that colonies with access to goldenrod maintained weight better than colonies without goldenrod available as a major nectar resource. These results confirm the importance of having plentiful floral resources at the end of the growing season for honey bee survival. Higher colony weights indicate more nectar was stored from goldenrod within the colony. These results suggest that colonies will struggle to survive the winter without a plentiful late-season resource like goldenrod. By allowing breaks in row crop plantings and investing in programs like CRP, we can support honey bees and many other important beneficial insect species.

## Entomology

### **Fungi's Effects on Varroa Mites**

Nicole Sammons. Dr. Reed Johnson. Department of Entomology.

The parasitic mite *Varroa destructor*, more commonly known as the varroa mite, is a major threat to the western honeybee *Apis mellifera*. Methods to control varroa mites are very limited, as it is challenging to kill an arthropod pest of an arthropod, and the evolution of resistance in varroa to most popular chemical controls further limits control options. Due to these growing mite control issues, it is important to explore the performance of new mite controls, including biological control agents. The goal of my project is to evaluate the effect three different fungi have on the varroa mite's behavior and to see if any of these fungi could be used as a biological control agent against the varroa mite. More specifically, I examined whether the presence of fungal spores on the surface of host nurse bees affects the choice behavior of adult female varroa mites. A behavioral assay was performed where the mites had a choice between a nurse bee inoculated with the fungal spore solution and a nurse bee with no inoculation. Results showed that one of the three fungi and the positive control had a repellent effect against varroa. Overall, my research has provided evidence that one of the three fungal biocontrol agents has a repellent effect against varroa mites.

## Environmental & Plant Sciences (4 Projects)

### **Seasonal Changes in Body Condition Within a Partially Migratory Population of Song Sparrows**

Gautam A. Apte. Dr. Christopher M. Tonra. School of Environment and Natural Resources.

Partial migration in birds, where some individuals in a population migrate and some remain resident, has been observed and documented for over a century, yet it remains poorly understood in comparison to more common migratory strategies. We investigated partial migration in a well-studied population of Song Sparrows (*Melospiza melodia melodia*) at the Wilma H. Schiermeier Olentangy River Wetland Research Park north of Ohio State University main campus. Margaret Morse Nice's 1937 study on this same population theorized the existence of multiple migratory strategies within both breeding and wintering individuals of this population, yet the environment has changed dramatically since that study and it is unclear if this remains the same. We captured Song Sparrows during the migration and stationary nonbreeding periods to color-band birds and collect data on morphology and body condition. We also conducted additional resighting surveys to determine presence and overwinter survival of Song Sparrows in this population. Using all Song Sparrow captures at the study site since 2015 (n=184), we looked at collected data to find trends that might account for differing migratory strategies among individuals. As Nice found, morphology data showed no significant bimodality that could account for the existence of two migratory strategies. We found that seasonal changes in body condition were substantial, and that variation in fat reserves and body mass within the population changed within the migration and stationary nonbreeding periods at the study site. Mean mass of captured birds rose substantially in winter months, and variation in stored fat reserves across all captured birds exhibited seasonal changes. Keeping in mind that adaptive fat regulation may account for some changes in body condition, it becomes difficult to determine whether these changes are direct influences on migratory behavior or more focused towards overwinter survival. These findings suggest the continued existence of multiple migration strategies among the population, yet more individual level data is needed to confirm these different strategies. Additional research may yield more information on relatedness of changes in body condition and migratory behavior in an individual Song Sparrow.

## **Environmental & Plant Sciences**

### **Effects of Cover Board Material and Canopy Cover on Thermal Conditions of Cover Objects for Snake Habitat Selection**

Danielle M. Hutchison. Dr. Peter C. Smiley Jr.

Thermoregulation is an important factor of habitat selection for snakes. Snakes use natural cover objects as a way to help regulate their body temperature. The use of artificial cover boards is a common snake sampling technique that replicates the benefits of natural cover. This study aimed to determine whether snake community structure and thermal conditions under cover boards differed between board materials and canopy cover levels. Snakes were sampled in 2020 and 2021 at four forested riparian sites, and in 2021 at three grass filter strip sites in Upper Big Walnut Creek watershed in central Ohio. Each site had three cover board pairs composed of one wood and one tin board, for a total of six cover boards per site. At forested sites, each pair was positioned to reflect a low, medium, or high level of canopy cover. Grass filter strip sites contained minimal canopy cover and as such the boards were positioned at the beginning, middle, and end of each site. Loggers under each board recorded temperature at 5 minute intervals. Three snake species were documented from 16 captures at forested sites and 30 captures at grass filter strip sites. Snake abundance, richness, percent occurrence, percent garter snake occurrence, and the maximum, minimum, and average temperatures under the boards did not differ ( $P > 0.05$ ) between board types and canopy cover at forested sites. Snake abundance and occurrence were greater ( $P < 0.05$ ) under wood boards than tin at grass filter strip sites. Tin boards experienced higher daily maximum temperatures and lower minimum temperatures ( $P < 0.05$ ) than wood boards at grass filter strip sites. These findings indicate that the effect of board type on snake capture is greater at grass filter strip sites than forested sites. The greater frequency and abundance of snakes found under wood boards at grass filter strip sites suggest that the lower minimum and higher maximum temperatures associated under the tin boards are unfavorable to snakes compared with the more stable thermal environment provided by wood boards. In riparian habitats with minimal canopy, wood cover boards are the preferred sampling device.

### **Agronomic Grower Theories - Phantom Yield Loss**

Wyatt Kissell. Dr. Alexander Lindsey. Department of Horticulture and Crop Science

The concept of mysterious yield loss, more commonly known as “Phantom Yield Loss” has become a hot topic for corn producers within the last few years. For many years, farmers would test moisture of a corn field by harvesting a few passes with their combine. If they deemed the corn too wet, they would come back later to finish harvesting. In many cases, when the farmer would return, they would be surprised to find that yields were lower, but they never knew why, because in theory the dry matter yield should not decrease substantially (should be within 3-5% of one another). In reviewing literature surrounding the grower theory of Phantom Yield Loss, experiential reports suggest that substantial dry matter reductions within corn kernels were occurring (greater than 10% reductions). This loss begins as soon as kernels reach physiological maturity, commonly called black layer, and can continue until kernels reach a moisture of 15.5% moisture. Research shows that weather factors such as temperature and humidity are the main variables influencing kernel drying and how quickly kernels respire. While harvest inefficiencies may explain some losses, the reported total dry matter reductions are greater than what one would expect from kernel respiration and harvest losses alone. More research into this phenomenon would help discern why there is such a disparity in yield based on harvest timing.

## **Environmental & Plant Sciences**

### **Can Understanding the Effect of Light Intensity on *Diaporthe ilicicola* Growth and Sporulation Help Explain Fruit Rot Development in Winterberry?**

Aleacia Laird. Isabel B Emanuel. Dr. Francesca Peduto Hand. Department of Plant Pathology.

Winterberry (*Ilex verticillata* and hybrids) are deciduous woody ornamental plants producing brightly colored fruits that persist on the branches through winter. These traits make the plants popular choices in landscape design and as woody cuts for winter holiday decorations. Unfortunately, a recently described fungal pathogen, *Diaporthe ilicicola*, has shown to cause latent fruit rot in winterberry, negatively impacting the marketability of both the plants and cut branches. The symptoms of this disease include fruit which are undersized, discolored, lack a glossy cuticle and become rotten. *Diaporthe ilicicola* infects plants in Spring through open flowers, but fruit rot symptoms only develop in late-Fall when fruits are fully mature. The research conducted in this study aimed to determine whether increased fruit exposure to light following plant defoliation in the Fall, influences how *D. ilicicola* grows in the latently infected fruit and, in turn, whether this could trigger the development of symptoms. To observe how light intensity affects the growth of *D. ilicicola*, four isolates of the fungus were grown *in vitro* under three light environments: (1) artificial light filtered through a shade cloth, (2) artificial light blocked with aluminum foil, and (3) unfiltered artificial light. Isolates were grown on ½ strength Potato Dextrose Agar plates under each of the light conditions at 25 degrees celsius for three weeks. Colony growth was measured weekly while pycnidia and spore counts were recorded at the conclusion of the trial. The trial was set up using a split-plot randomized complete block design with three blocks and two replications, and the whole experiment will be conducted twice. Initial results show that hyphal growth, pycnidia formation, and spore number of *D. ilicicola* are influenced by exposure to light. All four isolates showed an increase in hyphal growth and pycnidia number with increased light intensity, suggesting that plant defoliation could alter growth of *D. ilicicola* and be related to the rapid development of symptoms in the field late-season. Future research will attempt to visualize these fungal growth changes *in vivo* using fluorescent protein transformation, and this information will be used to help inform disease management strategies and prevent crop loss.

## **Food Science (6 Projects)**

### **Use of Handheld FT-NIR Sensors to Rapidly Quantify Cannabinoids of Hemp in SITU**

Cameron Jordan. Dr. Luis E. Rodriguez-Saona. Department of Food Science and Technology.

Rapidly determining the amount of  $\Delta$ -9-tetrahydrocannabinol ( $\Delta$ -9-THC) and cannabidiol (CBD) that is contained in hemp is important for growers, buyers, processors, and analysts alike. Current methods for cannabinoid determination include liquid chromatography-mass spectroscopy that requires destruction of the hemp flower and can take two weeks to receive results and requires sample preparation. Near-Infrared sensors provide a rapid analysis that can be done *in situ*. Our objective was to develop technology for quantifying two predominant cannabinoids (THC and CBD) through NIR spectral signature profiles enabling real-time field-based measurements. Hemp samples were scanned using a prototype handheld Fourier Transform Near-Infrared scanner. These samples were whole hemp flower samples. Samples were measured in duplicate using a 10 second exposure time. The major cannabinoid content was determined by ultrahigh-pressure liquid chromatography and detection was achieved by LC-MS/MS detector with an electrospray ionization source. The spectral data were analyzed using chemometric methods to determine the amount of cannabinoids present. Spectral data combined with the reference data from LC-MS/MS were analyzed by partial least square regression (PLSR). PLSR results showed excellent signal-to-noise ratios and good linearity, predicting major cannabinoid content with strong correlation ( $R_{pre} > 0.9$ ) and low standard error. NIR spectra obtained from the handheld scanning device for intact hemp flower generated very reproducible fingerprints. uHPLC-MS/MS analysis showed a wide variation of CBD (8 – 11 g/100g) and THC (0.05 – 0.25 g/100g) levels in samples. NIR sensors can be used to monitor the quantity of cannabinoids during the growing process since it is a non-destructive analysis. The sensors could also be used by growers to quickly quantify their products before they are distributed. The results of the FTIR scans (15 sec) require no sample preparation and no use of harsh chemicals. Handheld FTIR technology provides a thorough analysis for a market that requires a faster analysis.

## Food Science

### **The Dating Game - Understanding Expiration Phrase-Date Salience Using Eye-Tracking Technology**

Talia Katz. Aishwarya Badiger. Dr. Christopher Simons. Department of Food Science. Dr. Brian Roe. Department of Agricultural, Environmental, and Development Economics.

Expiration dates on food products have been known to promote food waste in consumer households. Current policies on date labeling target standardizing the phrases without any efforts to expand date horizons. The current research in this field is unclear regarding whether the date (Nov 29) or the phrase (e.g. sell by) has the greatest impact on food discard. Eye tracking technology is a useful tool which can be used for visual analysis. Visual analysis allows researchers to see beyond just the explicit feedback that participants provide and see truly what they are looking at. This technique was used to analyze how consumers look at milk expiration dates and what ultimately encourages them to keep or discard foods by conducted a mixed design study with 68 participants. Panelists wore eye-tracking glasses throughout the study and saw multiple milk carton images on the screen featuring different dates. Along with the images, they were given physical milk samples to smell which they were told were from the image on the screen. Data was processed in Tobii Pro Lab software and a Mixed ANOVA model was used. The results indicated that viewers tend to fixate on the date more than the phrasing ( $p < 0.001$ ) when making their discard decisions. On average, 50% of the panelists did not look at the phrase at all. Panelists tend to fixate more on the date when a “use by” label was present as opposed to “best if used by” or “sell by” label ( $p = 0.037$ ). Since the label phrase is rarely looked at when making discard decisions, standardizing the phrases is unlikely to reduce food discard by itself. The results from this study inform current policy development surrounding date labeling with the potential to influence food discard and consequently food waste.

### **Myostatin Mutation in Japanese Quail Increased Egg Size but Reduced Eggshell Thickness and Strength**

Cameron McCurdy. Joonbum Lee. Christopher Chae. Jinwoo Hwang. Madeline C. Karolak. Dong-Hwan Kim. Cassandra L. Baird. Dr. Benjamin M. Bohrer. Dr. Kichoon Lee. Department of Animal Sciences.

Recently developed myostatin (MSTN) mutant quail and chickens demonstrated similar effects of MSTN on muscle and fat developments between avian and mammalian species. However, the effect of MSTN mutation on the quality of eggshells, an important avian specific characteristic, has not yet been investigated although egg production traits of mutant quail have been studied. In this study, several parameters for eggshell quality, including eggshell size, eggshell weight, eggshell breaking strength (EBS), and eggshell thickness, were all compared between MSTN mutant and wild-type (WT) eggs. MSTN mutant eggs had greater height and width along with heavier eggshell weight compared to WT eggs, which shows proportional improvement in egg size as affected by the MSTN mutation. However, EBS and eggshell thickness were decreased in mutant eggs compared to WT eggs. In addition, the palisade layer, the thickest and most important layer for the strength of an eggshell, was also decreased without a change in the number of vesicular holes. These data indicated that decreases in the thickness of the eggshell and the palisade layer would be a main factor contributing to a lower EBS in mutant eggs. MSTN mutant quail provide a useful model to better understand the function of MSTN on avian uterine cell development and eggshell biomineralization.

## Food Science

### **Optimization and Characterization of Tryptophan Concentration to Enhance Serotonin Production by Probiotic Lactic Acid Bacteria**

Celeste Miller. Israel Garcia-Cano. Diana Rocha-Mendoza. Erica Kosmerl. Dr. Rafael Jimenez-Flores. Department of Food Science and Technology.

Serotonin, an important neurotransmitter also known as 5-hydroxytryptamine (5-HT), positively impacts psychological diseases, depression, stress, and sleep disorders. In the gut, 5-HT is primarily produced by enterochromaffin cells that line the gastrointestinal tract through the hydroxylation and decarboxylation of the precursor tryptophan. To complement this neurotransmitter production, probiotic lactic acid bacteria (LAB) in the gut can aid in the production of 5-HT and benefit the host. Therefore, the objective of this work was to characterize the production of serotonin by LAB that possess the genes encoding serotonin catabolizing enzymes, as well as determine the optimal precursor concentration for maximum serotonin production. 5 LAB strains were pre-screened for probiotic characteristics and enzyme encoding genes. Out of these strains, two strains, *Pediococcus acidilactici* and *Lactobacillus helveticus*, were selected and grown in casein glucose broth media at 37°C overnight. The cultures were then incubated with various concentrations of the tryptophan precursor--0, 10, 20, 40, 60, 80, or 100 mM--overnight to activate enzyme production. The cultures were centrifuged, and the supernatant was extensively filtered using a Sep-Pak C18 column with a methanol elution followed by vacuum evaporation to collect and concentrate 5-HT. Each sample was measured for serotonin production by spectrophotometry using Ehrlich's reagent and heat to initiate the color reaction with measurements at 625 nm. The concentrations of the precursor tryptophan yielding the greatest 5-HT production were 80 mM for *P. acidilactici* and 100 mM for *L. helveticus* resulting in a 7-fold and 15-fold increase in 5-HT production, respectively. The findings of this work provide a fundamental basis for the co-supplementation of *P. acidilactici* and *L. helveticus* with tryptophan to enhance serotonin production and allow for future studies which investigate how bioactive nutrients, such as the milk fat globule membrane, affect neurotransmitter production. Inclusion of this dairy component and serotonin-producing probiotic bacteria in a functional dairy food product has significant potential to promote consumer health.

### **Efficient Production of Novel Colorants for the Food Industry Using 4-vinylguaiacol and Black Carrot Juice**

Thania N. Ortiz Santiago. Gonzalo Miyagusuku-Cruzado. Dr. M. Monica Giusti. Department of Food Science and Technology.

Consumer concerns have risen regarding the utilization of synthetic colorants due to potential harmful effects. Consequently, the food industry is transitioning towards naturally sourced options. Anthocyanins are pigments found in fruits and vegetables however, they lack stability in most food systems. Pyranoanthocyanins, anthocyanin-derived pigments with improved stability, are a promising alternative; nevertheless, their scarcity and time-consuming formation limits their viable usage. Pyranoanthocyanins can be formed using hydroxycinnamic acids as cofactors, but formation is time-consuming. 4-Vinylphenols, decarboxylated hydroxycinnamic acids, may be more efficient cofactors yielding pyranoanthocyanins in shorter times with higher yields, however studies on their usage for pyranoanthocyanin formation is limited. The objective of this research was to determine the most efficient anthocyanin-to-4-vinylguaiacol ratio for production of pyranoanthocyanins. Stock solutions of black carrot-derived anthocyanins and 4-vinylguaiacol, decarboxylated ferulic acid (FA), were prepared with water at pH 3.1. Experimental solutions were prepared for a final anthocyanin-to-cofactor molar ratios ranging from 1:1 to 1:30. A FA control was prepared at an anthocyanin-to-cofactor molar ratio of 1:30. Incubation was carried out at 45°C for up to 96 hours. uHPLC-PDA-ESI-MS/MS was used to determine pigment identities and monitor pyranoanthocyanin formation every 24 hours. Statistical analyses for significant differences and kinetic model construction were conducted using GraphPad Prism. Incubation with 4-vinylguaiacol or FA resulted in the formation of new. These new peaks showed longer retention times, a hypsochromic shift in wavelength of maximum absorption, and increased mass-per-charge ratio consistent with 10-guaiacyl-pyranoanthocyanins. Yields with 4-vinylguaiacol as a cofactor were up to ~4 times greater than those with FA (8.1±1.9%), with this efficiency being affected by the anthocyanin-to-cofactor molar ratio (p<0.01). Ratios of 1:5 and 1:10 resulted in greatest (p<0.01) pyranoanthocyanin yields (31.0±1.1% and 25.1±0.4%,

## **Food Science**

**Efficient Production of Novel Colorants for the Food Industry Using 4-vinylguaiacol and Black Carrot Juice (continued)** Thania N. Ortiz Santiago. Gonzalo Miyagusuku-Cruzado. Dr. M. Monica Giusti. Department of Food Science and Technology

respectively). Pyranoanthocyanin formation with 4-vinylguaiacol as compared to FA followed different kinetic models. Formation with 4-vinylguaiacol followed pseudo-first-order kinetics while that with FA followed a zero-order model. Overall, 4-vinylguaiacol was a more efficient cofactor for pyranoanthocyanin production than its precursor, ferulic acid. This work will help enable the future viable use of pyranoanthocyanins in foods facilitating the transition towards naturally sourced pigments.

**Differentiation of Virgin and Refined Coconut Oil using NMR Spectroscopy Coupled with Chemometrics** Cam Rich. Fenfan Tang. Dr. Emmanouil Chatzakis. Department of Food Science and Technology.

Coconut oil is extracted from the coconut palm fruit. It is consumed widely due to its distinct coconut aroma and higher melting point compared to other vegetable oils, which makes it a solid in room temperature. Although it is high in saturated fatty acids, which are associated with negative health effects, it also contains triglycerides esterified with medium chain fatty acids, which have been linked to certain health benefits. The two main extraction methods for coconut oil production are the wet and the dry processing. Virgin coconut oil is commonly extracted via wet processing, which requires higher production cost and has lower yield, resulting in its higher value. Refined coconut oil is usually made from dried coconut kernel or copra through dry processing and has little coconut aroma. In addition, refined coconut oil is subjected to additional processing steps to improve its properties and it has a lower nutritional and commercial value compared to virgin coconut oil, as it is losing many nutrients during refining process. Because of its higher price, virgin coconut oil is often adulterated with cheaper refined coconut oil. As a result, it is of great interest of international traders, regulatory agencies, and consumers to have powerful tools that allow the distinguishment of virgin coconut oil from refined coconut oil. Nuclear Magnetic Resonance (NMR) spectroscopy has diverse applications as a food analysis technique. It is rapid, highly reproducible, non-destructive, and can be used for food compositional analysis without purification or extraction. In this study, coconut oils were analyzed using high field and low field NMR and multivariate data analysis techniques were utilized for the differentiation of refined and virgin coconut oils. The analysis was able to successfully differentiate the virgin and refined coconut oils by 1D <sup>1</sup>H high field NMR coupled with principal component analysis and orthogonal partial least squares-discriminant analysis. Certain fatty acids and various biomarker compounds were identified. By using NMR-based analysis and chemometrics, the food industry can further enhance quality control and safety of coconut oil products, while combatting adulteration.

## **Social Sciences (6 Projects)**

### **Utilizing the Community Capitals Framework and Community Network Mapping to Analyze the Impacts of COVID-19 and the Federal Stimulus Packages on Poverty in Vinton County, Ohio**

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In March 2020, countries around the world entered mass lockdowns to stop the spread of the COVID-19 pandemic. The pandemic has affected not only global health, but the economic viability of communities, and has been the influence behind many financial adjustments in areas who were already struggling with poverty before the pandemic hit. The purpose of this study is to document recent direct and indirect causes of poverty in Vinton County, Ohio, and how COVID-19 and the federal stimulus bills have affected poverty in the area from March 2020 to January 2022. Through the concepts of the Community Capitals Framework and community network mapping, this research aims to provide Vinton County community leaders and organizations with an understanding of which community assets impact poverty and what areas they can improve upon to address the issue, while taking COVID-19 and federal relief into consideration. A list of community-based organizations (CBOs) has been identified through observation and snowball sampling to create a community network map. The community network map is used as a visual tool for understanding the flow of assets between groups, and how CBOs within the Vinton County community interact. Although the economic impact of the pandemic on Vinton County is not yet entirely known, it was concluded that infrastructure is a leading cause of poverty in Vinton County, specifically water and broadband infrastructure, in which the pandemic highlighted. Conclusions raised the argument that local leadership in small, rural communities such as Vinton County is aging and overwhelmed, causing strain on asset distribution and allocation. CBOs inside and connected to Vinton County were already benefitting from bonding and bridging social capital pre-pandemic to accomplish shared missions, visions, and goals, and during the pandemic, many CBOs focused on making an impact in ways they knew how, and oftentimes found themselves going in circles with the same set of leading organizations. CBOs not associated with the community network can bridge social capital to additional organizations using the provided map to accomplish said visions, spreading the load of development work across the community network and not a specific set of leading organizations.

### **Validation of Extracellular Glucose Depletion as a Mock Measurement of its Uptake in Cells and Tissues *ex vivo***

Shanvanth Arnipalli. Dr. Ouliana Ziouzenkova. Education and Human Ecology

In both industrialized and developing countries, diabetes has increased drastically, and it affects people in all age groups. Diabetes is invoked by hyperglycemia due to the deregulation of glucose uptake in tissues under insulin-resistant states. Patients with diabetes continue to develop debilitating complications such as retinopathy, neuropathy, and vascular damage that increase risks of stroke, heart disease, amputation, kidney failure, and blindness. Thus, the ongoing worldwide epidemic of diabetes increases the demand for the identification of environmental, nutritional, endocrine, genetic, and epigenetic factors affecting glucose uptake. The measurement of intracellular fluorescence is a widely used method to test the uptake of fluorescently-labeled glucose (FD-glucose) in cells *in vitro* or for imaging glucose-consuming tissues *in vivo*. This assay assesses glucose uptake at a chosen time point. The intracellular analysis is based on the assumption that the metabolism of FD-glucose is slower than that of endogenous glucose, which participates in catabolic and anabolic reactions and signaling. However, dynamic glucose metabolism also alters uptake mechanisms, which would require kinetic measurements of glucose uptake in response to different factors. Here we describe a method for measuring extracellular FD-glucose depletion and validate its correlation with intracellular FD glucose uptake in cells and tissues *ex vivo*, with completed data collection. Extracellular glucose depletion may be potentially applicable for high throughput kinetic and dose-dependent studies, identifying compounds with glycemic activity and their tissue-specific effects. The development of safe therapies addressing glucose metabolism in specific tissues can offer a solution to many diverse populations and patients with cancer, dementia, aging, diabetes, autoimmune diseases, obesity, and other conditions. Moreover, the applications of these methods in environmental sciences can be pertinent in seeing how glucose metabolism is affected in organisms experiencing climate change. Glucose is a key energy source that is available at ease for organisms to utilize for fueling their activities. Glucose metabolism and undisrupted regulation play central roles in energy acquisition, storage, and reproduction. Fibroblasts from organisms of interest in different temperature settings can be collected, cell-cultured, and utilized in these methods to better study the chronic thermal stress and metabolic stress on glucose metabolism, induced by climate change.

## Social Sciences

### **Social Media Usage in OSU ANR Extension Communication**

Callee Aviles. Kiley Holbrook. Haley Schmersal. Erica Summerfield. Dr. Annie Specht. Department of Agricultural, Communication, and Leadership

**Purpose of the Study**-This study's purpose was to conduct an evaluation of the Ohio State Agriculture and Natural Resources (ANR) Extension team's social media use and how usage compares to United States averages for media usage. ANR Extension has a wide range of teams disseminating information to the community. To ensure an organization is effective in their communication strategy, periodic evaluations of communication outlets should be performed by individuals outside of the organization (Goodwin et al., 2015). No previous research has evaluated the media outlets used by the 31 ANR Extension teams. **Research Method**-We performed a quantitative analysis of social media outlets used by the 31 teams in ANR Extension. Each researcher was randomly assigned a list of ANR teams to evaluate. To evaluate social media use, each researcher investigated the presence of each outlet for their assigned ANR teams using a Qualtrics instrument to collect observational data. After data collection, we calculated frequencies of social media outlets used by ANR teams. These frequencies were compared to United States media use averages provided by the Pew Research Center in 2021 (Auxier & Anderson, 2022). **Findings**-There were five media outlets found to be used by the ANR extension teams. Facebook was the most prominent media outlet with 51.61% (16) of teams with accounts. In 2021, 61% of Americans reported utilizing Facebook as a media outlet. Twitter was the second most prominent media outlet with 32.26% (10) of ANR teams utilizing accounts compared to 23% of Americans who use the outlet. Other media outlets utilized by ANR teams were YouTube (22.58%, 7), Instagram (12.90%, 4), and TikTok (3.23%, 1). All outlets were utilized less than the national average (YouTube 81%, Instagram 40% and TikTok 21%). There were two ANR teams found to not utilize media outlets.

**Implications**-The findings of this audit of media outlets provide valuable information for ANR Extension's future communication efforts. Our comparisons show that some gaps exist between ANR Extension's outreach and typical media use in the U.S.; identifying and understanding these gaps will assist in future efforts to improve ANR communication.

### **Exploring Research Outreach and Engagement in the Department of Agricultural, Communication, Education, and Leadership**

Maryellen Bliss. Lindsey Okuley. Alyssa Rockers. Dr. Amanda Bowling. Dr. Annie Specht. Department of Agricultural, Communication, Education, and Leadership.

The need to address grand challenges is at the forefront of most universities research initiatives and drives many funding requests. Grand challenges present as complex problems, which must be approached from multiple expertise areas using multiple methodologies. As such, interdisciplinary research approaches and teams are encouraged to address them. Social scientists are often added to bench science teams to develop, administer, and evaluate extension or educational outreach components due to their expertise in these areas. But how do these faculty members and departments advertise their expertise to other faculty within their college, university, and beyond? The study is constructed on a conceptual framework of interdisciplinarity and organizational communication. Knowledge creation is increasingly multi- or interdisciplinary, and research institutions may create environments to encourage interdisciplinary team building and share that information via various organizational channels. Specifically, websites are a useful tool for interdisciplinary organizations to share information with the public and stakeholders. We analyzed departmental websites related to the social science fields of agricultural communication, education, extension, and leadership to determine how faculty expertise was advertised. The sample for this study was university websites of departments that had at least two of the following programs: agricultural communication, agricultural education, agricultural leadership, and extension education at land-grant, tier-one research institutions, which resulted in 21 departments. After identifying the sample, a website content analysis was conducted to understand how these universities showcase their faculty's research. Preliminary results indicate that most department websites require multiple clicks to reach faculty expertise. Most websites analyzed contain a research tab in the website navigation to direct audiences to faculty research. While all department websites included faculty research descriptions on inner pages for each faculty member, some included this information on a research-specific page. Many websites included a current page showcasing active projects and grants in the department.

## Social Sciences

### **Analyzing the Impact of COVID-19 on Farm Participation in Oregon's Farm to School Program**

Jillian Horan. Dr. Zoe Plakias. Department of Agricultural, Environmental, and Development Economics.

Farm to School (F2S) programs exist in many communities throughout the United States. They involve partnerships between farmers and neighboring K-12 school districts to provide students with fresh, local foods in school lunches, as well as educational opportunities surrounding nutrition, the environment, and food production. Proponents of these programs and current research on them suggests they may yield a range of potential benefits for the communities involved. These benefits may include improving nutrition and food security in children, creating more reliable marketing outlets for local farmers, strengthening community ties by keeping funds circulating within the local market, and increasing the overall resilience of the local food system. However, the COVID-19 pandemic has disrupted the functionality of both our school systems and our food systems. In this project, I consider the characteristics of farms participating in Oregon's F2S program pre-COVID and explore which farm characteristics are associated with continued participation in F2S programs during COVID using multiple econometric methods. In order to accomplish this, I use data on F2S transactions provided by a community partner in Oregon and data I collected about the characteristics of farms participating in Oregon F2S programs using a systematic web search. By doing so, this work will advance our understanding of how the COVID-19 pandemic has altered connections within Oregon's local food systems, as well as highlighting important farm-level factors that impact food system resiliency, and areas for additional improvement and support.

### **Teacher Perspectives of Establishing Youth Development Organizations in Agriculture for Minority Students**

Nicole McMullen. Colby Gregg. Dr. Amanda Bowling. Department of Agricultural Communications, Education and Leadership

**Introduction:** MANRRS primarily seeks to support students who belong to disenfranchised groups to explore interests within agriculture, natural resources, and related sciences at the postsecondary level. Additionally, MANRRS seeks to increase interest in agriculture-related sciences for seventh through 12th graders by implementing Junior MANRRS Programs at the secondary level. These programs include low-cost conferences in addition to institutes hosted by certain partner universities. While much is known about how MANRRS is managed at the postsecondary level, no research could be found that examined the experiences of advisors who implement and advise Junior MANRRS chapters, or how chapters operate in the secondary environment. This project seeks to fill this gap within the literature. **Purpose:** The purpose of this study is to explore how and why Junior MANRRS chapters are incorporated into secondary schools. **Methods:** This study utilized a qualitative case study method that was guided by a constructivist perspective. Participants recruited for this study include three Junior MANRRS advisors who worked within high schools and have served as an advisor for more than three years. Data were collected via semi-structured interviews that were then transcribed and analyzed using the constant comparative method. **Findings:** Three themes arose from the analysis and can be described as 1) need for inclusion of smaller sectors of agriculture, 2) positions of leadership being different from being a leader, and 3) diversity is not always visual. **Implications:** These findings tell us that there needs to be a more diverse representation of the agricultural sector - including natural resources and environmental sciences as it pertains to MANRRS programming and events. Additionally, advisors need to be flexible in what their chapters look like based on their settings, schools, and limitations. Support for Junior MANRRS chapters can include examples of alternative models of leadership teams in addition to varied and consistent funding resources.