

# COWPOKE

# NEWS

Department of Animal & Food Sciences, Oklahoma State University  
Research 2019





# Contents

- 4** Faculty Research Updates
- 6** Hair Sheep Show Higher Resistance to Heat and Parasites than Wool Sheep
- 8** Muriana Promotes Food Safety
- 10** Ottimo Sabbatico Italiano
- 12** Utilizing Predictive Modeling and Risk Assessment to Enhance Microbiological Safety of Meat
- 14** Novel Alternatives to Antibiotics
- 17** Precision Supplementation Technology on Improving Beef Cattle Performance
- 18** Impact of Injection-Site Lesions on Bovine Muscles
- 19** Animal Well-Being During Water Conservation
- 20** Conducting Research Abroad
- 22** OSU Student Group Receives Funding to Improve Research Presentation Skills
- 23** OSU Graduate Student Receives Scholarship; Attends Food Safety Conference
- 24** Joyjit Saha Receives Travel Scholarship to Food Protection Conference
- 25** FAPC Hosts Annual Research Symposium
- 26** Thesis & Dissertations



**28** Research Opportunities Help Undergraduates Gain Experience

**30** UGRS Program

**31** Undergraduate Research Scholars

**32** Herbanimal Extracts as Antibiotic Alternatives

**33** Efficacy of Sodium Acid Sulfate to Reduce Foodborne Pathogens From Bell Peppers

**34** Isolation and Characterization of Naturally Occurring Bacteria from Equine Uterus

**36** Research Grants (2019)

**39** Presentations (2018)

**43** Publications (2018)

**45** Sponsors

### ***On the Cover***

An agar plate with bacterial growth is shown on the cover of this edition. It is part of an experiment being conducted by Samantha Howe, an undergraduate student and Niblack Research Scholar. Read more about her research on page 34. Photo by Rebekah Alford.

### ***About our Research***

The Oklahoma State University Department of Animal and Food Sciences is committed to contributing to science through both basic and applied research. Our research disciplines consist mainly of animal health, breeding, genetics, food safety, meat science, non-ruminant nutrition, physiology, ruminant nutrition, well-being, and sustainability. Our faculty and students conduct various research projects throughout the year in the pursuit of new discoveries.



# Faculty Research Focus

*The research faculty and their current focuses are listed below.*

**Paul Beck** - Nutrition, production, and management of growing and finishing beef cattle.

**Scott Carter** - Impact of diet on nutrient excretion and gaseous emissions; effect of alternative feedstuffs on growth performance and carcass traits; and effects of feed additives on growth performance and carcass traits.

**Udaya DeSilva** - Metagenomics of rumen and other microflora and microbial ecology of soil treated with animal manure.

**Andrew Foote** - Ruminant nutritional physiology.

**Darren Hagen** - Animal genetics, including bovine genome sequence analysis and annotation; the development of statistical models and algorithms to better classify proteins; and the development of databases.

**Ravi Jadeja** - Developing food safety strategies.

**Divya Jaroni** - Development of effective strategies to control foodborne pathogens at pre-harvest and post-harvest levels.

**Janeen Johnson** - Environmental adaptability of domestic animals and of minimizing stress in animal-production environments in order to improve animal well-being, health, and productivity of farm animals.

**David Lalman** - Beef cattle nutrition and management with emphasis on genetic by environment interactions in beef production systems.

**Gretchen Mafi** - Prediction of meat tenderness and palatability; development of value-added meat products; and use of new technology to predict quality.

**Peter Muriana** - Use of natural antimicrobials to prevent spoilage and pasteurization of intact shell eggs to eradicate salmonella.

**Adel Pezeshki** - Animal metabolism and energy balance regulation, especially as applied to the mechanisms regulating energy expenditure.

**Ranjith Ramanathan** - Postmortem muscle biochemistry and meat quality; application of metabolomics in meat quality research; role of mitochondria in beef color; and myoglobin and lipid oxidation.

**Ryan Reuter** - Forage-based beef cattle nutrition and management; effects of supplementation and grazing management on beef cattle production and sustainability; and incorporating technology into grazing systems.

**Leon Spicer** - In vitro and in vivo approaches to study nutritional, hormonal and growth factor control of ovarian function and follicular development including the study of insulin-like growth factor-I (IGF-I) as an endocrine factor linked to energy balance in early lactating dairy cows; and the study of metabolic factors such as insulin, leptin, adiponectin, IGF-I and fibroblast growth factor 9 in ovarian follicular function and milk production.

**Deborah VanOverbeke** - Effect of management practices on meat yield, quality, palatability and sensory attributes; evaluation of post harvest management techniques to improve meat quality; and prediction of tenderness and palatability.

**Blake Wilson** - Applied beef cattle nutrition and management; health, immune function, and management of high-risk calves during the receiving/backgrounding period; and trace mineral nutrition.

**Glenn Zhang** - Modulating synthesis of endogenous host defense peptides (HDPs) for disease control and prevention; structure-activity relationship studies of novel HDPs (bacterial killing and/or immunomodulation); and role of microbiota in animal health and productivity.

## COWPOKE NEWS

Cowpoke News is published three times a year by the Oklahoma State University Department of Animal and Food Sciences (AFS). We strive to keep students, alumni and friends of the department informed about our activities and successes. Cowpoke News is distributed through both e-mail and mail and is available 24/7 at [afs.okstate.edu/cowpoke-news](mailto:afs.okstate.edu/cowpoke-news). To subscribe, e-mail us at [cowpokenews@okstate.edu](mailto:cowpokenews@okstate.edu) or mail in your request. Please give us your full name and either your e-mail or mailing address.

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## Ramanathan Receives ASAS Award



Ranjith Ramanathan received the 2018 Animal Science Outstanding Young Animal Scientist Award (Research) from the American Society of Animal Science (ASAS) Southern Section.

His research focuses on both fundamental and applied aspects of beef quality to better understand beef color issues. His goal is to better understand the role of postmortem meat biochemistry in order to increase the knowledge and economic benefits associated with improved muscle food appearance.

Ramanathan serves as coordinator for the Undergraduate Research Scholars Program within AFS. He has secured over \$1.4 million as a PI and Co-PI from federal agencies, commodity groups, and industry. In addition, he has published 47 peer-reviewed journal articles, 72-refereed abstracts, one book chapter, and four full-paper conference proceedings.

## Michael Sims Joins Research Staff

Michael Sims began working for AFS on January 7, 2019, as the new ruminant nutrition laboratory supervisor. He was born and raised in Texarkana, Arkansas. At the age of seventeen, he enlisted in the United State Army and spent eight years serving in both active duty and reserve roles. In 2003, her received orders for Operation Iraqi Freedom and was awarded the Army Commendation and National Defense Medals.

After serving in the military, he received a Bachelor's of Science degree with a focus in biology and chemistry from Texas A&M university in Texarkana before pursuing his master's degree in animal science from the University of Arkansas. After a year into his degree, he was offered a position at Oklahoma State University. Sims will continue his master's degree at OSU, which focuses on animal science production.

"I am very interested doing behavioral work with cattle," Sims said. "I believe using behavior as a tool we can advance the animal production industry, particularly in addressing the consumer perception of this field."

Sims plans to continue his research from the University of Arkansas, which involved collecting data for a small trial looking at both cow and calf disposition scores at birth, chute scores at weaning, and weaning weights.

## University Awards Convocation

Faculty and staff in the Oklahoma State University Department of Animal and Food Sciences were recognized at the 2018 OSU University Awards Convocation! Below is a list of faculty and staff members who received recognition at the Convocation.

### Newly Appointed Chair and Professorship Holders

Paul Beck – Dennis and Marta White Endowed Chair

Janeen Salak-Johnson – Temple Grandin Endowed Professor

### Regents Distinguished Research Award

Glenn Zhang – Ralph and Leila Boulware Endowed Chair

### Leave the Ladder Down Award

Jared Cullison – Staff Category

## Zhang Recognized with Research Award

Glenn Zhang was one of seven top research faculty honored with the 2018 Regents Distinguished Research Award. Recipients must be recognized both nationally and internationally within their field of study, as well as have outstanding and meritorious achievements in research.

Zhang is a molecular biologist, professor, and Boulware Endowed Chair within the Oklahoma State University Department of Animal and Food Sciences (AFS). His research focuses on modulating synthesis of endogenous host defense peptides (HDPs) for disease control and prevention; structure-activity relationship studies of novel HDPs (bacterial killing and/ or immunomodulation); and role of microbiota in animal health and productivity.

His research has led to the development of viable alternatives to antibiotics for both humans and livestock.

Zhang serves as the AFS research coordinator and research committee chair. During his career, he has been invited to present over 50 times both nationally and internationally.





# Hair Sheep Show Higher Resistance to Heat and Parasites than Wool Sheep

By Rebekah Alford

Anyone who has spent time in Oklahoma between June and September has probably experienced the hot and humid summer weather. Without proper precaution, the summer heat can quickly turn from an annoyance to a health risk. This poses a problem for not only people, but for their animals as well.

Wool sheep typically do well in Oklahoma's winter climate, but have a hard time during the hot summer months. After all, who wants to wear a thick sweater in July? Producers must shear sheep multiple times a year in an effort to keep the animals cool, which can be time consuming and costly.

Most wool sheep in Oklahoma aren't actually produced for wool; they are produced for meat. This means their wool is more of a byproduct that can be a hassle for both the rancher and the sheep. The wool makes sheep susceptible to heat stress during hot

summer months and shearing them takes time and money.

The Oklahoma State University Sheep and Goat Center has maintained a flock of St. Croix, Katahdin, and Barbado crosses for the past six years. These hair sheep have a reputation for doing well in hot climates.

"Our wool breeds are mostly raised for meat in this state," said Jerry Fitch, professor and state sheep specialist. "They handle the colder temperatures extremely well, but they don't handle the heat and humidity that we have in the summer and that's where the hair sheep have worked extremely well."

The hair sheep have proven to tolerate Oklahoma's hot summers well. During the colder months, they produce a very heavy winter coat of mixed wool and hair. Since they shed this coat in the spring, producers do not have to shear the flock.

"As far as our wool sheep, we'll shear most of the lambs at the barn," said Darin Annuschat, herd manager at the OSU Sheep and Goat center. "We haul our ewes to a sheep shearer, paying \$4 - \$5 a head to shear them twice a year."

The main reason for shearing the OSU wool sheep is to help keep the animals cool during the summer.

"Heat stress is real," Annuschat said. "Oklahoma is a very hot state, and there are times that the wool breeds can get heat stress if the wind doesn't blow enough. That becomes an issue."

Not only do the hair sheep tolerate the heat better than wool sheep, but they are also more tolerant to internal parasites. Round worms are the most common parasite threat for sheep and goats in Oklahoma.

"Hair sheep work extremely well because they are heat tolerant and



PHOTO / REBEKAH ALFORD

somewhat parasite tolerant,” Fitch said.

The entire OSU wool sheep flock is dewormed approximately every 60 days to prevent roundworm buildup and eventual anemia problems. For the OSU hair sheep flock, only a few need deworming (approximately 5% to 7% of the flock each year).

Fitch has been conducting research to see if any of the hair sheep in the flock have parasite resistant genetics.

“We know hair sheep crosses are fairly parasite resistant, or at least tolerates them better,” Fitch said. “We are looking to see if we have any individuals within the flock who are very parasite resistant, and so far we have been very pleased.”

Since hair sheep are excellent foragers, Fitch is also doing a comparison between rotational and consistent grazing to see if rotational grazing will result in a reduction of

parasites. In many ways, he has found hair sheep to be a great alternative to wool sheep.

“We manage them more like we would handle a cattle operation,” said Fitch. “We watch them every once in a while at lambing time to make sure there’s not any problems, but for the most part they are on their own.”

During lambing season, the hair sheep typically do a good job of getting their lambs up and taking care of them without any assistance. Since they don’t require a lot of maintenance or supervision, the OSU hair sheep herd is handled more like a commercial setting.

“As far as management on the hair sheep, it’s way less intense,” said Annuschat. “We have to be with the wool sheep flock quite a bit, especially during lambing season.”

The OSU wool sheep flock often requires a lot of special care during

lambing season. This includes night checks, pulling expectant sheep from the flock to put in lambing jugs, and delivering lambs.

“If you lamb wool sheep in April or May in Oklahoma, you will have a 5-10% death loss throughout the summer because they do not handle the heat and humidity well at all,” said Fitch.

Hair sheep have proven to be much more self-reliant than their wooly cousins, who seem high-maintenance in comparison when shearing, parasite control, and lambing season are taken into account.

If you raise sheep for meat in Oklahoma, you might consider a hair sheep breed. Since hair sheep crosses are resilient and adapt well to the Oklahoma climate, producers can take a more hands-off approach. The only question is, what are you going to do with all that extra time?

# Muriana Promotes Food Safety

By Rebekah Alford

Twenty-two years ago, Advance Foods-Gilliland Endowed Professor Peter Muriana joined the Oklahoma State University Department of Animal and Food Sciences and the Robert M. Kerr Food and Agricultural Products Center. Muriana conducts research, provides outreach, and teaches food sciences classes with a focus on food safety as both a professor and food microbiologist.

He enjoys working with students and finding ways to increase their professional experience. Each year, he helps organize the FAPC Research Symposium so students have an opportunity to practice presenting their research. He also mentors graduate and undergraduate students in his research lab.

"I perform pathogen-inoculated validation studies that benefits my student involvement in food microbiology projects other than their niche research areas," Muriana said. "My graduates have gone on to advanced research/academic positions as well as managing food micro in-house labs or quality control/HACCP positions with Oklahoma food companies."

Muriana has a passion for both research and food safety, and combines the two by working with food safety interventions. His area of expertise includes general food microbiology, lactic acid bacteria, and foodborne pathogens. Last year, he evaluated culture collections and animal isolates for potential probiotic, biopreservatives, and useful fermentative bacteria in one of his projects.

His overall goal is to find ways to make food safer. One way he does this is by sharing his knowledge with others. He often makes appearances on the SUNUP television show and in FAPC videos providing tips on how a person can use food safety best practices in their everyday lives, such as the holiday season or tailgating.

Within FAPC, he helps Oklahoma food processors to increase their value

by assisting in food safety procedures and tests during further processing. He works with a variety of companies to ensure their products and techniques are safe for the end consumer. Some of the products he has worked with over the years include bagged poultry, onions, beef hot dogs, gas-fired flame ovens, and sanitizers.

In 2018, a South African company needed microbial validation for the processing of their meat product, biltong. They were building a plant in North Carolina but couldn't start production until they received USDA-FSIS process approval.

When the company contacted Muriana to ask if he could perform microbial validation studies with pathogens for their traditional biltong product, he responded, "Sure, no problem! Umm... what is biltong?"

Biltong is a dried, cured meat product originating from South Africa. It is similar to the beef jerky made in the U.S. but is thicker and made with different ingredients. It also requires a longer drying time in comparison to beef jerky.

Biltong is air dried for four to six days and includes spices and vinegar as a curing agent. The product is made without heat, unlike beef jerky which cooks in a dehydrator for up to 12 hours.

"It doesn't have a heat lethality step but still has to pass USDA-FSIS 5-log reduction of Salmonella," Muriana said. "We took it on and provided multiple replications and got over 5-log reductions each time!"

Muriana has learned there are multiple U.S. companies interested in selling biltong. One company opened a biltong production facility in Oklahoma last year, and there are stores already selling biltong alongside their beef jerky products. Since the project, several companies have sought out Muriana's expertise on validating biltong after hearing about his success.

We are excited to see what products Muriana will work with next as he continues to use his food safety knowledge and experience to help producers, consumers, and students be 'food safe.'

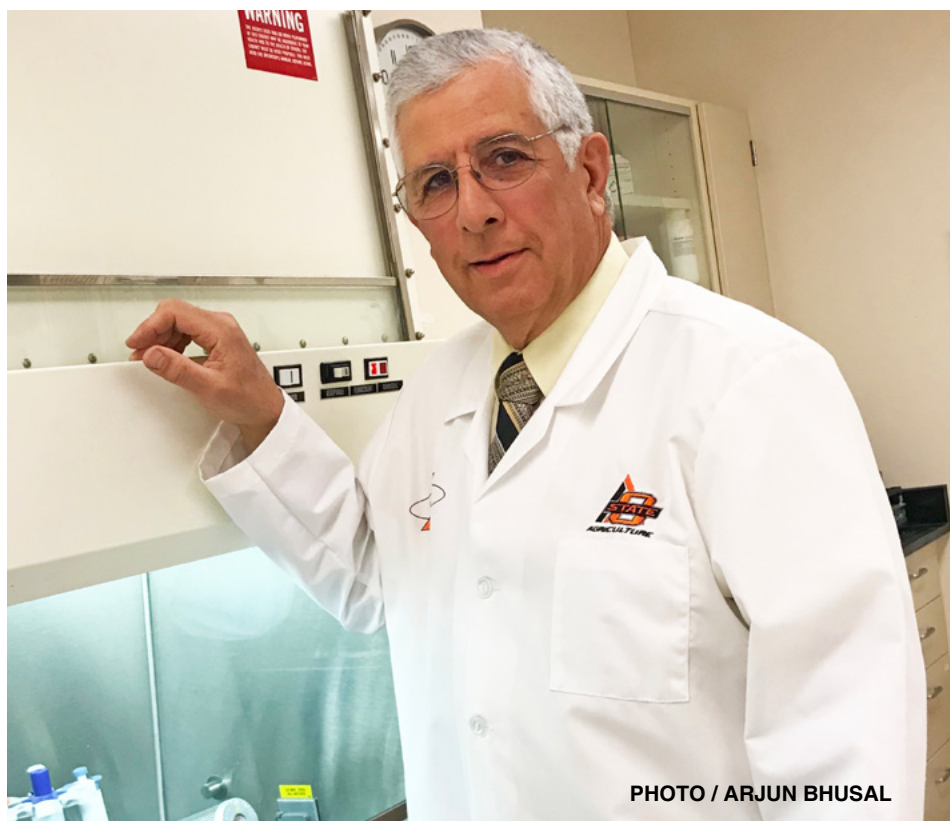


PHOTO / ARJUN BHUSAL



Refined/standardized cuts of Biltong beef pieces



Fixed volume inoculation (0.1 ml / side)



Vacuum tumbler chamber (15 in Hg)



Biltong beef hanging in humidity oven



PHOTOS / PETER MURIANA

Salmonella cultures



'Gloved-finger' inoculum spreading



Vacuum tumbler marination (sloped)



Trial #1: 4 treatments hanging in oven



Centrifuge/re-suspend cultures



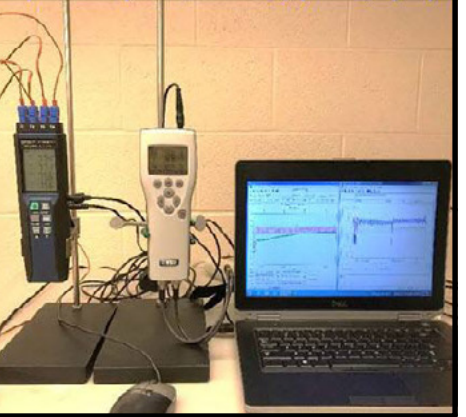
Baskets/containers for dip treatment



Biltong beef (post-vacuum-marination)



Temperature probe, humidity probe, laptop



# Ottimo Sabbatico Italiano

By Rebekah Alford

Leon Spicer, Ph.D., was granted the opportunity to take a sabbatical for the second time in his academic career. The first time, he spent a year at Stanford University Medical School. This time his sabbatical spanned six months during 2018 and allowed him to visit three different Italian universities; the University of Naples Federico II, University of Milan, and University of Padova. Spicer was able to focus on different techniques regarding physiology at each university.

Spicer has organized and led 12 OSU study abroad trips to Italy and has hosted various Italian faculty and graduate students in his reproductive physiology lab. Along with his ongoing research collaborations in Italy, this has given him experience with both the Italian language and culture. Spending time in Italy on a sabbatical allowed him to work closely with faculty members in the universities he visited.

“While in Naples, I learned the art of in vitro fertilization (IVF) in

water buffalo and Holstein dairy cows,” Spicer said. “The laboratory I studied in was in the Department of Veterinary Medicine and Animal Production with Bianca Gasparrini, D.V.M, Ph.D., a world-renowned IVF expert and member of the International Embryo Technology Society. I had the opportunity to visit local water buffalo and Holstein dairy farms assisting with breeding and pregnancy detection.”

Spicer spent over two months at the University of Milan’s Department of Veterinary Medicine as a visiting



professor. He worked with Francesca Caloni, D.V.M., Ph.D., a well-known veterinary toxicologist, continuing their research collaborations writing three peer-reviewed articles. Spicer also assisted with classroom instruction in biotechnology and toxicology courses, focusing on wildlife and production animals.

At the University of Padova, Spicer worked with Roberto Mantovani, Ph.D., in the Department of Agronomy, Food, Natural Resources, Animals and Environment. In addition to planning future collaborations, he spent time with University of Padova faculty in the Dolomites in Northern Italy learning about dairy cattle grazing systems and cheese production.

“In addition to the professional development aspects, my time in Italy provided cultural enrichment that will last a lifetime,” Spicer said. “This unique opportunity in Italy provided a chance to meet many professors from around the world and I made many new friends and contacts in the field of animal and veterinary sciences.”

Sabbaticals give faculty an opportunity to step away from normal research, teaching, or extension duties in order to pursue scholarly activity. It can provide time to reflect on a variety of ideas and concepts, to think broadly and learn more about their field of study, and to expand their organizational and professional experiences. They also serve as a form of ‘continuing education’ for faculty.

“Sabbatical leaves are granted to tenured faculty members for study, research, or other activities directed toward professional growth,” Spicer said. “To qualify for a sabbatical, one must have served as a faculty member for six academic years since initial appointment or since a previous sabbatical leave.”

Spicer recommends sabbaticals but says only a small percentage of faculty take advantage of them because it can be a financial hardship. Spicer feels those who do take a sabbatical usually come away with a refreshed way of thinking, and if time was spent abroad, come away with a new view of life and approach to societal problems.



# Utilizing Predictive Modeling and Risk Assessment to Enhance Microbiological Safety of Meat

By Joyjit Saha and Divya Jaroni

In the past two decades, *Shigatoxigenic Escherichia coli* (STEC) has been identified as the causative agent in numerous foodborne illness outbreaks linked to beef products, particularly ground beef. As part of the commensal microflora of cattle, STEC could easily contaminate beef carcasses, despite several antimicrobial treatments at various production and processing levels. Beef carcass trims used primarily in ground beef processing, which involves grinding and packaging of these trims, could result in increased risk of pathogenic contamination.

Additionally, temperature abuse of contaminated ground beef during retail storage (> 5 °C) could also influence pathogen growth. To lower the risk of contamination and subsequent foodborne illnesses, some ground beef processors have started using beef trim-wash as an added intervention. Although conventional sanitizers, such as organic acids, are used as beef trim interventions, their efficacy at abuse temperatures is questionable, especially during longer retail storage. It is important to find alternatives that would maintain effectiveness throughout retail storage. Bacteriophages, known for enhanced activity at higher temperatures, could serve as alternatives for beef trim interventions. However, it is not certain if this would help reduce the risk significantly enough to be worth the cost. It is therefore important to understand the effectiveness of any intervention prior to actual implementation.

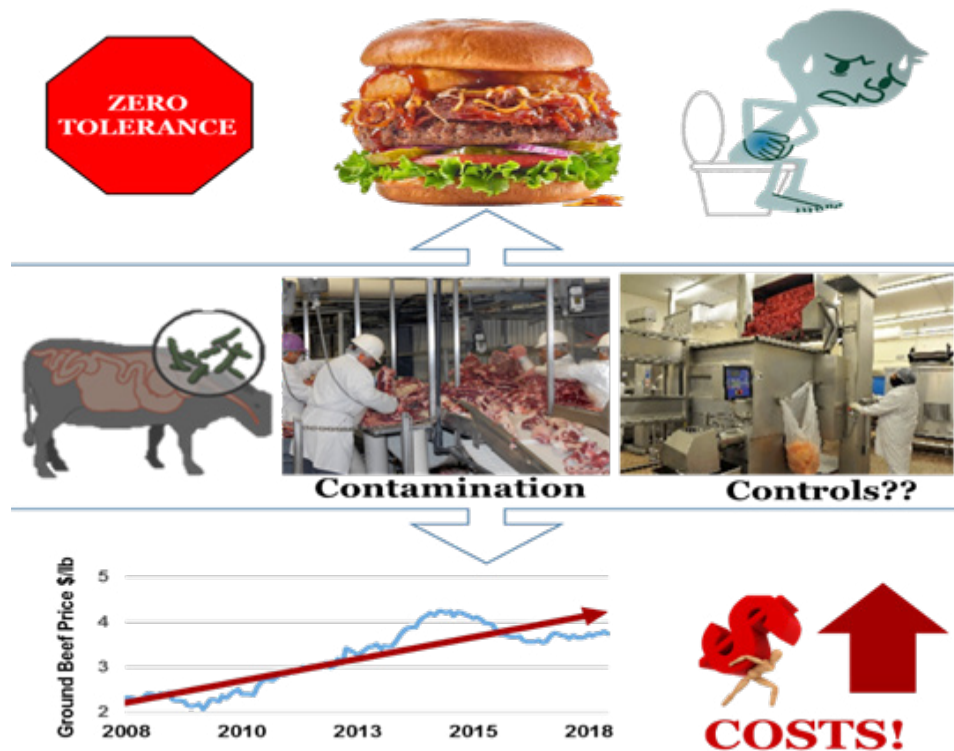
Quantitative microbial risk assessment (QMRA), which assesses the risk of foodborne illness from current production practices and predicts the effectiveness of proposed

interventions, could help processors make an informed decision. At the same time, it could also be used as a decision-making tool to select interventions without the hassle of actual implementation, which would be more economical and efficient. This would help processors make an informed decision before choosing an intervention.

Currently, I am working on finishing my dissertation project which looks at the application of bacteriophages as beef trim intervention to control STEC in ground beef. Apart from my dissertation project, I worked on several additional projects during my degree. These projects include assessment of risk factors associated with the occurrence of STEC on small-scale cow-calf operations in Oklahoma and Louisiana, isolation and characterization of bacteriophages, accelerated survival and shelf life modeling of phages, cooking validation

studies for mechanically tenderized steaks, and looking at various antimicrobials for their potential for biofilm disruption.

Among these projects, prediction of the safe cooking time of mechanically tenderized beef steaks got the most attention from both the industry and American Meat Science Association (AMSA). Mechanical tenderization is an integral part of commercial meat processing in the U.S. It involves piercing of the intact meat with needles/small blades and ensures consistency in the tenderness of resulting products. According to a 2004 nationwide retail survey, 45% of the retail meat was labeled as moisture-enhanced or mechanically tenderized. The popularity of tenderized poultry and meat products, however, has also been accompanied by serious food safety concerns. The technique of blade/needle-piercing could lead to the increased transfer of



IMAGES / JOYJIT SAHA & DIVYA JARONI

the surface pathogenic bacteria into the previously sterile deep tissue.

Since 2000, six outbreaks related to non-intact meat product have been reported by CDC. Mandatory labeling requirements by the USDA-FSIS for cooking instructions of mechanically-tenderized beef products requires validation of safe cooking times. However, determination of safe cooking times for individual steak cuts of different sizes and weights is tedious. At the same time, cooking validation studies are costly and time-consuming.

Therefore, developing a predictive model to simulate real-time scenarios, without undergoing repeatability of costly experimentation, would help alleviate the problem. After model building, the next phase of the research looked into developing software, underpinning predictive model, for easy user access interface. The developed software accurately predicted safe cooking times with 80% accuracy using simple inputs. An easy to use and accessible software for calculating safe cooking times could be used to help address some of the shortcomings of cooking validation studies and to generate instant labels.

I chose this project because food safety research is the need of the hour and this project could have an enormous impact on both consumers and the food industry. Foodborne illness outbreaks and recalls, associated with both meat and fresh produce, have increased over the past two decades. There has not been a single year without these outbreaks and recalls. Some major contributing factors for this increase include evolving pathogenesis of microorganisms through increased virulence and low infectious dose, antibiotic resistance, multiple sources of contamination, changes in food production and processing, and global distribution. Furthermore, the microbial hazards in food can be a problem, originating at the farm, to processing, retail, and all the way to the consumer's household.

The risks associated with microbial hazards in the food industry could, therefore, be mitigated through a

functional farm-to-fork approach. One of the ways to meet the needs of the industry is to use data intelligence such as predictive modeling, bioinformatics, data visualization, and artificial intelligence to assess and reduce food safety risks.

In the past, predictive modeling has been used for weather forecasts, space calculations, and business forecasts. Over the past two decades, its use as a food safety tool has seen a recent surge. Predictive modeling, which incorporates mathematics, statistics, engineering, chemistry, and biology to study various processing parameters, can provide quick and inexpensive testing of "what if" scenarios. Its importance lies in its prediction capability because "If We Can Predict, We Can Prevent." In simple language, imagine you are preparing for a game day, you pull up your phone and check for weather updates and decide what you want to wear. If it's going to rain; you carry a rain jacket.

Similarly, if you can predict food safety risk, you can prevent it. In a hypothetical scenario, if there is a rainfall event and it floods your cattle farm, chances are high for STEC contamination. With the right tools, we can predict how much risk has increased and whether you need an extra step of intervention further down in the beef food chain. Analyzing the threat, adding an intervention, and lowering the STEC contamination risk would lessen the chances of foodborne illness outbreaks and increase food safety.



### About Joyjit Saha

Joyjit Saha's research on calculating safe cooking times was highlighted by the American Meat Science Association in MeatingPlace magazine, "When meat meets math - Predictive modeling to determine safe cooking times of tenderized beef steaks," and in Animal Frontiers, "Modeling Techniques for Prediction of Safe Cooking Times of Mechanically Tenderized Beef Steaks."

His software invention secured intellectual properties for OSU due to its high commercial potential. This project also helped to secure a travel grant of \$3000 from the National Science Foundation I-Corps and a business competition grant of \$7000 from Riata Center for Entrepreneurship - Spears School of Business in accelerate OSU Business competition in 2018.

His research efforts produced ten peer-reviewed publications (published/reviewed/under preparation), 29 abstracts, and two research articles in various peer-reviewed journals along with one provisional patent/invention disclosure on software development for cooking validations.



# Novel Alternatives to Antibiotics

By Kelsy Robinson

I am currently a fifth year Ph.D. student in the OSU Department of Animal and Food Sciences. Raised in southeast Arkansas, I obtained my bachelor's degree in animal science from the University of Arkansas before joining OSU in June 2014 as a USDA-NIFA National Needs Fellow. I was the first student accepted directly to the department's Ph.D. program without a master's degree.

I began my research career working in Glenn Zhang's lab to discover novel alternatives to antibiotics. During my first two years at OSU, I focused on the ability of dietary compounds to modulate host immunity in an effort to improve animal growth and prevent disease. This work, both in vitro and in vivo, laid the foundation for the current work of other students in our department investigating the ability of these compounds to alleviate necrotic enteritis in broiler chickens.

With the advent of the next-generation sequencing technologies, the ability to analyze and interpret big data has become a vital part of biological research. I became more interested in the field of gut microbiome and bioinformatics, and was drawn to the wealth of knowledge that sequencing data can produce. Plus, I loved the challenge of learning an entirely new field. Each experiment and set of data is a new puzzle to figure out. As the technology advances, there is always something new to learn.

Currently, I am working on several microbiome and bioinformatics projects focused on the relationship between intestinal microbes and animal growth performance in broiler chickens. Investigations into the intestinal microbial community, the

microbiota, of humans and mice have demonstrated a strong relationship between the microbiota composition and host health and metabolism. However, less is known about the role of the microbiota in livestock, particularly where broiler chickens are concerned. As livestock production moves into the antibiotic-free era, I believe modulation of the intestinal microbiota holds great promise to improve animal growth and feed efficiency.

My research involves raising broiler chickens from hatch to market age in order to collect intestinal samples on a weekly basis. Host and microbial DNA or RNA is then isolated for next-generation sequencing. I use various bioinformatic programs to analyze the large sequencing data

PHOTOS / REBEKAH ALFORD



to determine the changes in the gut microbial composition or chicken mRNA expression levels. To date, I have completed projects emphasizing the effect of various antibiotics on the gut microbiota in an effort to illuminate the mechanism by which antibiotics improve animal growth.

I have also investigated the correlation between bacterial composition and growth performance in chickens in order to identify key bacterial species that are critical for growth and feed efficiency, with the goal to develop them as novel, more effective probiotic supplements. As various fungi are an integral part of the gut microbiota, I just finished defining the intestinal fungal community, also known as the mycobiome, in chickens. I am now in the process of studying the role of gut mycobiome in animal growth and disease resistance.

### About Kelsy Robinson

To date, Kelsy has co-authored five peer-reviewed papers, and was the first author on two of these papers. Several additional manuscripts have been submitted for publication or are being finalized for submission. She has shown great skill in communicating her research.

While a student at OSU, Kelsy has received multiple presentation awards for her research work. Some of her awards included the Graduate Student Research Paper Certificate of Excellence at the 2016 and 2017 Annual Meetings of the Poultry Science Association, 2nd place in the 2017 Whiteman Oral Presentation Competition, and 3rd place in the 2018 Annual OSU Biological Sciences Research Symposium. She also placed 3rd at the CASNR Three-Minute Thesis (3MT) Competition in 2016 and 2017 and was named the People's Choice Winner in 2016.

Most recently, Kelsy competed and received a highly prestigious USDA-NIFA Predoctoral Fellowship,

*(continues page 16)*



which was awarded competitively from around the U.S. based on the quality of proposed research, as well as the credentials and leadership potential of the applicant. The fellowship will fund her research on gut microbiome through the completion of her doctoral degree.

Kelsy has been very active in providing invaluable leadership and services to our department, college, and university. She was president of the Graduate Student Association in the OSU Department of Animal and Food Sciences between 2017-2018 and is passionate in organizing various departmental activities, such as the Totusek Seminar Series and Smokarama. In addition, she has been serving as an ambassador for the Graduate College since 2015 and was recognized for her service by the Graduate College in 2016 and 2017.

Kelsy is very active in helping with various other activities on campus, such as the OSU Career Fair, open house, 3MT finals setup, and the graduation ceremony. She is also a good mentor to undergraduate students with a strong commitment to their success. She has mentored five different undergraduate research scholars in Glenn Zhang's lab. Each has developed a good rapport with her and, more importantly, each has excelled in their research. Some of her undergraduate mentees' awards include two Niblack Scholarships and four Wentz Scholarships from OSU and a Fulbright Student Scholarship from the U.S. State Department to study in Germany. One student recently received the Barry Goldwater Scholarship in 2018, the most prestigious undergraduate STEM scholarship in the United States.

Additionally, Kelsy has been an avid teacher in the department by involving herself regularly in the teaching of biotechnology and other classes. While engaged actively in various activities, Kelsy maintains a perfect 4.0 GPA. Upon graduation, Kelsy plans to pursue a career in academia. She hopes to continue her love of teaching, research, and student mentorship through a career as a university professor.





# Precision Supplementation Technology on Improving Beef Cattle Performance

By Taylor Husz

I've been working on my master's degree with Dr. Ryan Reuter and his lab group since January 2018. My research is new precision supplementation technology that addresses the nutrition of individual animals.

This technology can help producers manage their herds more efficiently based on the needs of their individual animals. We hope this technology will result in cattle that are generally healthier, more productive, and more profitable. Precision supplement feeders can be used in all sectors of the beef industry, including cow-calf operations and stocker or backgrounding units. However, just as with all new technology, the feeders can be expensive.

Therefore, I wanted to look at how many steers could use this equipment at a time, without changing the animal's behavior. Increasing the number of animals using this technology would make it more cost effective.

Mixed breed beef steers ( $n = 128$ , initial BW =  $257 \pm 29.2$  kg) were randomly assigned to eight paddocks. One paddock (16 steers) was selected to have continuous access to the feeder for the duration of the 16-week trial and was designated the "tester"

paddock. The automated feeder consisted of a large bin that dispensed supplement into four feeding stations. Supplement dispense was triggered by the presence of an eligible animal's RFID tag. Each steer was limited to 0.50 kg supplement per day by the electronics of the feeder.

Weekly, additional paddocks were commingled with the tester paddock to increase competition for the feeder. This resulted in a stocking density from four to 32 steers per feeding station in various weeks. A crossover design method was used to develop the sequence of stocking densities, to balance potential residual or carryover effects.

Approximately 30% of the steers did not voluntarily use the feeder; therefore, actual competition was less than targeted in the study design. Supplement intake and GPS location were recorded for steers in the tester paddock and averaged for each week. Week was the experimental unit ( $n = 16$ ). Weekly mean supplement intake and time spent near the feeder were regressed on feeder stocking density. Tester steers consumed an

average of 0.36 kg of supplement per day. Competition for a feeder space numerically reduced ( $P = 0.15$ ) supplement intake by 0.002 kg/d per steer of competition. Steers spent 6% of the time within 25 m of the feeder regardless of competition ( $P = 0.82$ ).

This data illustrates that in scenarios similar to these experimental conditions, the feeder can be stocked with at least 32 animals per feeding station with minimal effects on supplement intake. Many other research questions have come about as a result of initial study.

This summer I will continue my research in an attempt to answer those other questions regarding precision supplementation technology. I am expected to complete all of my master's program requirements in December 2019.

My future plans are to work in research and development. My overall career goal is to work on making the beef industry more efficient and profitable, whether it is through new management practices, technology, or products.



PHOTO / TAYLOR HUSZ

# Impact of Injection-Site Lesions on Bovine Muscles

By Rebekah Alford

In the beef industry, injection site lesions can cause major economic loss by limiting the value and use of whole muscle cuts. Morgan Pfeiffer, animal science graduate student, conducted research on the injection-site lesions in muscles. The objective of this study was to evaluate the frequency and presence of injection-site lesions in the outside round muscles of cows.

“I chose to work on this project evaluating the injection-site lesions after working on the National Beef Quality Audit in 2016,” said Pfeiffer. “During the audit, many further processors were discussing their concerns with injection-site lesions and therefore, we felt it was necessary to evaluate the lesions, using the same methods as Roeber et al. (2002).”

Evaluating the frequencies and severity of injection sites allowed each segment of the beef and dairy industries to evaluate the progress made since the 2002 audit, as well as continue to create better management practices for the future. During the 2017 audit, Pfeiffer collected data from seven U.S. beef packing plants. She found that injection-site lesions were more frequent in rounds of dairy cows than in beef cows. This was on par with previous audits that had been done. The presence of injection-site lesions had declined by 20% in beef cow rounds and 35% in dairy cow rounds since 2000 (Figure 1).

Pfeiffer feels an improvement in how beef medication is administered and an increase in producer education is likely the reason for the reduction in lesions. Her research was published in the *Translational Animal Science Journal* in September of 2018.

“This project is important as it shows the industry where we are at in comparison to 2002 and allows us to find areas to improve upon in the future,” Pfeiffer said.

## About Morgan Pfeiffer

During her time at OSU, Morgan Pfeiffer has worked on multiple research projects. Her dissertation project focused on the tenderness, sensory, and fatty acid attributes of grass versus grain finished beef aged 14 and 28 days.

Pfeiffer has been active in the Oklahoma State University Department of Animal and Food Sciences, serving as assistant coach for the OSU Meat Judging Team and

the Meat Animal Evaluation Team. She has also been heavily involved in the American Meat Science Association (AMSA), serving as the 2015-2016 southern director and the 2016-2017 president on the Student Board of Directors.

Pfeiffer completed her degree and is now the marketing director for the Oklahoma Beef Council. She wants to help bridge the gap between consumers, producers, and all involved in-between.



IMAGES / MORGAN PFEIFFER

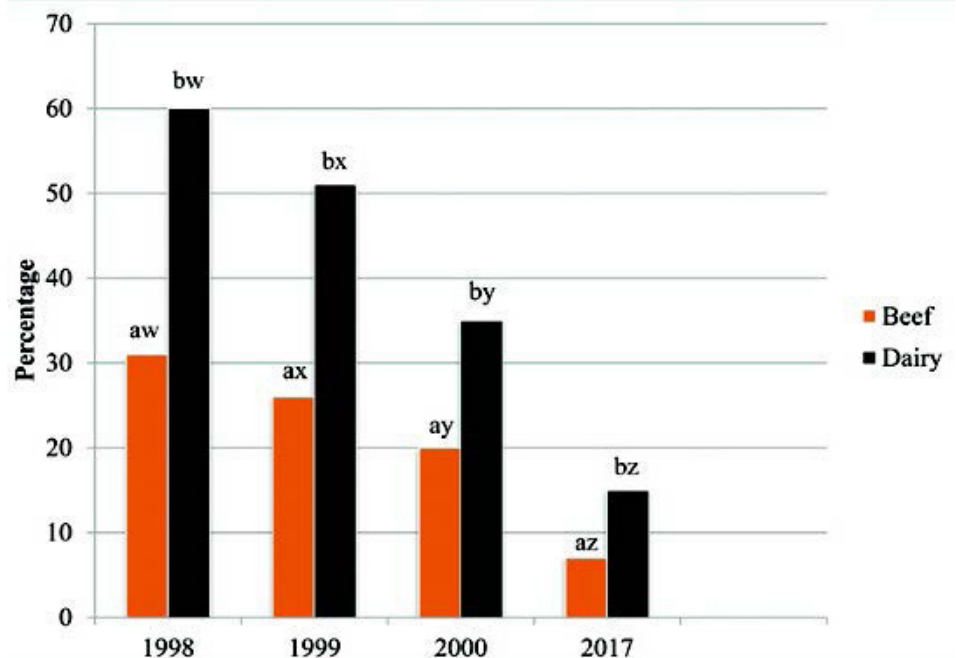


Figure 1: Percentage of beef and dairy cows with injection-site lesions during audits between 1998 - 2017



# Animal Well-Being During Water Conservation

*By Rebekah Alford*

Kelsey Bruno, animal science graduate student, worked on a research project at the Oklahoma State University Willard Sparks Beef Cattle Research Center which spanned over four years. The research provides a better understanding for how drought conditions affect beef cattle, as well as how to select animals that can best adapt to drought conditions.

“The goal of this project is to provide the first climate change adaptation tools for beef production systems regarding water management and selection of beef cattle that are adaptable to variation in water quantity and quality,” Bruno said. “To do this, we mimic drought conditions by restricting water intake to some extent for 10 weeks.”

In order to regulate and monitor water intake for the cattle in the experiment, Bruno used the Insentec

RIC system at the Sparks Center. This allowed her to control water intake for each animal. She also used a video camera system to record and monitor the cattle. The project required a lot of upkeep and maintenance, Bruno said.

“This project has required daily maintenance for the system and daily data collection for roughly four years, taking place at the Willard Sparks Beef Cattle Research Center,” Bruno said. “Overall, we collected baseline intake data for about 70 days, followed by a 28-day step-down period where animals are stepped down in water access, followed by 42 days of 50% of normal water intake.”

This process was repeated for eight groups of approximately 120 animals from 2014 to 2018. Bruno’s research focused on the behavior, health, and well-being of beef cattle.

“This research will provide a better understanding of the effects of

long-term water restriction on beef cattle, including effects on behavior, performance, and how to select for more water efficient animals,” Bruno said. “This will better help producers to select more efficient animals.”

## About Kelsey Bruno

Bruno has been active in the OSU Department of Animal and Food Sciences, including being involved in student organizations, research, and teaching. As a member of the Animal Science Graduate Student Association, she helped organize the Totusek Lectureship. In 2018, she received the Graduate Student Teaching Award at the NACTA Conference.

Bruno will receive her Ph.D. in animal science in May of 2019. Her goal is to become an assistant professor of animal science with a teaching and research appointment.

# Conducting Research Abroad

By Sydney Stewart

The Fulbright Program is a bilateral educational and professional exchange program funded and managed by the U.S. Department of State. Students holding a bachelor's degree or higher can study or conduct research abroad for 10-12 months (one academic year) or teach English for one to two years and are provided with financial and logistical support to do so.

I was a research fellow affiliated with the Institute for Animal Sciences at the Rheinische-Friedrich-Wilhelms Universität Bonn, a university in western Germany. I joined the Preventive Health Management Group and worked on a number of projects related to farm biosecurity, animal health and welfare, and antibiotic resistance. Though I was able to help with some animal handling and data and sample collection, Germany's strict rules and regulations regarding animal and pathogen research made it difficult for me to take on an independent farm or lab project.

Instead, I contributed to the group by translating technical bulletins, publications, and presentations between English and German (which was great for my vocabulary – in both

languages), and I wrote a review article on the practice of feeding unsaleable or waste milk back to dairy calves, which is currently undergoing revisions. I also helped teach the farm practicum portion of the Institute's OneHealth Master Program, a week-long mini-course designed to introduce non-agriculturists to the livestock and animal health fields.

At first, I was disappointed and frustrated that my role was limited to teaching and writing; but I eventually came to appreciate the opportunity to work on those skills and to delve into new topics. While teaching the OneHealth course, I realized I had a knack for politics and ag policy. Slowly but surely, my official Fulbright project became less about the science behind animal health and welfare, and more about how politics and market dynamics affect those outcomes.

The German-American Fulbright Commission (the administrators of my grant) were very supportive of this new project direction. At our mid-year meeting in Berlin, I was asked to sit for an NPR StoryCorps interview with another Fulbright grantee to Germany, an agricultural economist focusing on rural development; we had the

chance to share and compare our experiences at home and abroad and discuss the complex, multifaceted issue of food insecurity. Two days later, I presented my work with and my experiences in the German swine industry to an audience of roughly 550 of my peers; a month after that, I was recommended for and invited to a seminar in Brussels related to the future of work, particularly in the contexts of technology and automation.

Taking part in these seminars and working in Europe was an extremely humbling experience. I spent a lot of time trying to answer complex and often uncomfortable questions about the problems and controversies we face in the livestock and food industries. Having to justify practices we consider "routine" or "standard" to people without a strong agricultural or scientific background was not only a test of my knowledge, but also my honesty. While I genuinely believe we as an industry are doing the best we can with what we have, I have to admit that there are things I think we can, should, and must do better. We are not a shadowy, secret corporate conglomerate trying to turn a profit at the expense of everyone



and everything else. We're human beings who are trying our best, and sometimes we mess up. We owe it to the animals in our care and the people we feed to hold ourselves accountable for those mistakes and to always strive for better.

These conversations, while difficult, were very rewarding. I feel they've made me a more patient and empathetic person, and all-around a better scientist and advocate for agriculture. They've also given me a new perspective on and passion for global livestock health and welfare. After graduate school, I'd like to combine my experience, education, and new appreciation for politics into a career as a scientific advisor and consultant (and maybe, one day, diplomat) for the USDA's Agricultural Foreign Service.

It's hard to pick a favorite thing about my time in Germany because there was so much I loved about it. I really loved the people I worked with, too. They went out of their way to make me feel welcome and at home in Bonn, and they spoiled me constantly with sweets and snacks to try on road trips up north for farm work. (Fun Fact: For the last four months of my grant, I lived down the street from the headquarters of Haribo – the inventors of the gummy bear.) A few will be attending the American Society of Animal Science national meeting in

Austin this year, and I'm so excited to return the favor and introduce them to the culture of my home state. Also, my mom is originally from Germany, so I got to spend the holidays and a lot of my free weekends with her family and our dear family friends. Spring and summer were especially wonderful; the weather was perfect, the sun often didn't set until 11p.m., and plenty of three- and four-day weekends meant I had plenty of opportunities to travel and explore with friends.

Being a Fulbright grantee was extremely beneficial for me both professionally and personally. We live in a globalized society and it's important that we, as the next generation of agriculturists, understand the implications that globalization has for us and our industry. I'm proud of and grateful for my time abroad and I'd encourage any students considering an internship or study position abroad to take it and run with it.



PHOTOS / SYDNEY STEWART



# OSU Student Group Receives Funding to Improve Research Presentation Skills

By Mandy Gross

The Student Professional Development Group of the Oklahoma Association for Food Protection is improving research presentation skills through the Enhancing Short Creative Research and Innovations Presentation Techniques, or ESCRIPT, program, thanks to funding support for a second year.

The group received funding for 2018-2019 for Short Research Presentation Grants, sponsored jointly by the Oklahoma State University Graduate College and the Office of the Vice President for Research.

“The confirmation of funding means we have the opportunity to continue to develop as well-rounded researchers,” said Joyjit Saha, an OSU food science graduate student and ESCRIPT program past chair.

The ESCRIPT program provides training sessions through a lecture

series presented by experts, as well as discussion and practice sessions to improve short research presentation skills of graduate students enrolled in agricultural sciences.

For Conner McDaniel, an OSU food science graduate student and this year’s ESCRIPT chair, public speaking has always been a nerve-wracking task.

“Participating in the ESCRIPT presentations was a great way to build confidence before heading to a conference,” McDaniel said. “This was my first time to speak at anything in graduate school.”

Speakers from academic units around campus are invited to the ESCRIPT sessions to discuss five different objectives in research presenting, which teach graduate students how to speak in different settings with various audiences,

overcome public speaking fears, manage time and enhance presentation content.

“Each of the speakers puts their own twist on the topics they are talking about,” McDaniel said. “They present valuable advice. They’ve all been where we are now, so they can speak from personal experiences.”

In addition to hearing speakers, the graduate students have the opportunity to practice presenting their own research in front of faculty members of OSU’s Robert M. Kerr Food & Agricultural Products Center.

The experience McDaniel gained participating in the ESCRIPT program helped her win first place and the People’s Choice award during the OSU College of Agricultural Sciences and Natural Resources 2018 Three-Minute Thesis (3MT) Competition held Oct. 15.



PHOTOS / MANDY GROSS

Peter Muriana, FAPC food microbiologist and AFS professor, described the ESCRIPT program as “an ‘extra’ opportunity for students to present and fine-tune their research presentation skills before their participation at national meetings and speaking engagements.”

During the final session of the 2017-18 funding year, ESCRIPT participants were assessed based on their research presentation improvement throughout the program.

Judged by Muriana, OKAFP treasurer; Divya Jaroni, FAPC food microbiologist, AFS associate professor, and OKAFP chair; and Ravi Jadeja, food safety specialist, AFS associate professor, and OKAFP secretary, participants showing significant improvement were awarded \$150, \$100 and \$50 for first, second and third places, respectively.

The top graduate student presenters were Patrick Rydzak, first place; Dennis Pletcher, second place; and Sabra Billups, third place. Other participants were recognized with certificates for successfully completing the 2017-18 ESCRIPT training program.

The student group is planning more events for the 2018-19 school year, utilizing the funds received.

## OSU Graduate Student Receives Scholarship; Attends Food Safety Conference

*By Mandy Gross*

An Oklahoma State University graduate student was recognized for her academic ability, leadership potential, and passion for the food industry and food safety auditing profession.

Conner McDaniel, a food science graduate student, was selected as a recipient of a \$3,000 scholarship grant from the Food Marketing Institute Foundation for the 2018-2019 academic year.

The FMI Foundation scholarships are awarded to students currently enrolled in food and agricultural science majors who have a true interest in the field of accredited food safety auditing.

“I feel honored to have been selected as a recipient of the scholarship,” McDaniel said. “It is humbling to know that out of all of the applicants, I was selected.”

In addition to the scholarship grant, the FMI Foundation provided McDaniel with complimentary registration to attend the Safe Quality Food International Conference held Oct. 23-25 in Atlanta, Georgia.

McDaniel said the conference was beneficial in learning more about

implementing and improving a food safety and quality program.

“Not only did I learn many new things about the SQF code, I was also able to network and communicate with individuals from all different areas of the food industry,” she said. “Through these conversations, I feel as though I gained invaluable knowledge about multiple topics within the food industry. These connections are something that will provide an important resource for me moving forward.”

As a graduate student working at OSU’s Robert M. Kerr Food & Agricultural Products Center, McDaniel has gained real-world experience by assisting food companies in the development of food safety plans.

McDaniel said she is looking forward to applying what she learned at the conference to her daily responsibilities at FAPC.

In addition to helping food companies, she also is researching the use of different antimicrobials to reduce foodborne pathogens from fresh produce. McDaniel plans to graduate with her master’s degree in May 2019.

Ravi Jadeja, FAPC food safety specialist and assistant professor in OSU’s Department of Animal and Food Sciences, said McDaniel is well-deserving of this prestigious scholarship.

“I came to know Conner very well when she was a student in the HACCP [Hazard Analysis and Critical Control Points], audit schemes and quality control food safety classes that I teach,” Jadeja said. “As a graduate student in my program, she has always shown keen interest in assisting me with Extension and research projects and has done an excellent job. Conner is currently providing assistance to five small- and medium-sized processors who are working toward their first Global Markets, SQF, BRC and Primus audits.”



Conner McDaniel won 1st place and the People’s Choice Award at the 2018 CASNR Three Minute Thesis Competition where she presented her research on reducing bacteria in fresh produce. She went on to represent the college in the 2018 OSU 3MT Finals.

# Joyjit Saha Receives Travel Scholarship for Food Protection Conference

By Rebekah Alford

Joyjit Saha, food science Ph.D. student, is developing food microbiology predictive models to help reduce costly experimentation in the food industry. He received a student travel scholarship to the International Association for Food Protection Conference in Salt Lake City, Utah, and was invited to present this research at their annual meeting. The IAFP Student Travel Scholarship provides an industry or academic mentor based on research interest to help with networking.

“I was given an opportunity to be mentored by Leon Gorris, Director of Regulatory Affairs Global Food Safety & Capabilities, Unilever R&D, The Netherlands,” Joyjit said. “Dr. Gorris introduced me to the ‘Who is Who’ of the food industry, which has really been helpful to gain a foothold in this vast food industry.”

The scholarship also gave Saha an opportunity to be highlighted in a press release by IAFP and in the *Journal of Food Protection Trends*, which increases recognition among peers. Joyjit is a member of Microbial Modelling and Risk Analysis, a professional development group which helps individuals stay updated with current research.

“Joyjit is a self-starter when it comes to his research program,” said Clint Rusk, head of the OSU Department of Animal and Food Sciences. “He has completed numerous research projects related to food microbiology during both his M.S. and Ph.D. graduate programs. So far, Joyjit has published eight refereed journal articles, 20 abstracts and two research articles in high-impact, refereed journals, food-related magazines, and conference proceedings.”

In 2018, Saha was also recognized by the Graduate College for his academic contributions and received the OSU Foundation Distinguished Graduate Fellowship.

“I was fortunate to receive wonderful recommendations from Drs. Rusk, Carter, and Jaroni which helped me to achieve this fellowship,” Saha said. “This fellowship has helped me a lot to manage my fees over the semesters.”

Joyjit has also received recognition for an app he calls STEAK (Safe Temperature Estimator at a Klick). The app development business model earned second place in the accelerate 2018 OSU Business Plan Competition, which later helped Divya Jaroni, Ph.D., and Joyjit to receive a \$3,000 travel grant from the National Science Foundation.

“Joyjit has worked to develop predictive models in food microbiology to reduce the cost of experimentation in the food industry,” said Rusk. “Joyjit’s main research interest is in risk-mitigation of biofilm-forming foodborne pathogens in the food production and processing industry. He has been studying various intervention strategies.”

Joyjit continues to work on the STEAK mobile-app and plans to eventually make it available for purchase to businesses who would benefit from a quick and low-cost way to calculate cooking times. Recently, Joyjit received the Stanley E. Gilliland Memorial Fellowship in Food Science from the OSU Robert M. Kerr Food and Agricultural Products Center. This award recognizes overall achievement in food science.

“My future career goals are aimed at the development of successful interdisciplinary research and training programs addressing the needs of the food industry,” Joyjit said. “Most importantly, I am passionate about research in food microbiology/safety and interested in opportunities that help me get involved in collaborative research with computer science.”

Joyjit recently accepted a position at the University of Florida where he will be serving the food industry as a produce safety extension specialist.



PHOTO / IAFP



# FAPC Hosts Annual Research Symposium

By Rebekah Alford

Students from Oklahoma State University, Langston University, and University of Central Oklahoma presented their research projects at the FAPC Research Symposium on February 26th, 2019. There were graduate and undergraduate categories for poster and oral presentations. The oral presentations were 10 minutes long and were followed by a three-minute question and answer period. Monetary awards were given to the top three student presenters in each category. First place received \$250, second place received \$150, and third place received \$75.

This year's Research Symposium was sponsored by the Institute of Food Technologists (OK Section), Stillwater Chamber of Commerce, Oklahoma Association for Food Protection, and Stillwater Centennial Rotary Club. The winners are listed below.

## Graduate Oral Presentations

1st - Julia Sutton

2nd - Frank Kiyimba & Claudia Diaz (tie)

3rd - Thiago Belem

## Undergraduate Oral Presentations

1st - Wendy Gong

2nd - Monica Mascarenas

## Graduate Poster

1st - Dennis Pletcher

2nd - Tony Kountoupis

3rd - Caitlin Karolenko

## Undergraduate Poster

1st - Emmy Bechtold

2nd - Jessie Payne

3rd - Meodrick Shoemake

## Whiteman Research Awards

The 31st Annual Whiteman Award Competition was held February 2018. The event is held by the Oklahoma State University Department of Animal and Food Sciences.

Aksel Wiseman received 1st place, Joyjit Saha received 2nd place, and Elizabeth DeSocio received 3rd place.

Winners of the 2019 competition will be announced during the 2019 Animal and Food Sciences Banquet on April 5th, 2019.

## BMBGSA Research Symposium

Wentao Lyu and Kelsy Robinson, animal science Ph.D. students, both presented at the 2018 OSU Biochemistry and Molecular Biology Graduate Student Association Research Symposium. Wentao placed 2nd and Kelsy placed 3rd in the oral competition.

## Food Safety Professionals

In 2018, Sabra Billups, James Hearn, and Conner McDaniel (AFS students) were awarded the Food Safety Professional certificate from the Robert M. Kerr Food & Agricultural Products Center.

The new program is offered by FAPC and recognizes industry leaders and students specializing in food safety who have completed a designated number of workshops and trainings.

Students must complete two or more trainings and/or academic courses from each basic, regulatory, and advanced categorical group to become a FAPC Food Safety Professional.

To apply for the program, either download the FAPC Connect app by texting FAPC to 80802 or visit [www.fapconnect.com](http://www.fapconnect.com) and submit the Food Safety Professional form.

Julia Sutton received 1st place for her oral presentation at the 2019 FAPC Research Symposium. Left to Right: Chuck Willoughby, Julia Sutton, and Peter Muriana.



PHOTOS / MANDY GROSS

# Thesis & Dissertations

*The following students graduated with a M.S. or Ph.D. in 2018.*



**Sabra Billups** graduated with a M.S. in food science. She was advised by Ravi Jadeja. Her thesis was titled, "Development of a Novel Antimicrobial Ice Application for Meat Grinder Sanitation." She is currently reviewing multiple job offers.



**Catherine Haviland** graduated with a Ph.D. in animal science (nutrition focus). She was advised by Chris Richards. Her thesis was titled, "Effects of Metabolic Modifiers and Environment on Cattle Health and Performance." Cathy is now working in a post-doctorate position at Texas A&M.



**Audrey Boeken** graduated with a M.S. in food science. She was advised by Peter Muriana. Her thesis was titled, "Characterization and use of bacteriocin-containing microbial fermentates for control of *Listeria monocytogenes* in RTE meat applications." She is now working for Corbion in Kansas City, Missouri.



**Lindsay King** graduated with a M.S. in animal science (physiology focus). She was advised by Jerry Fitch.



**Allison Burenheide** graduated with a M.S. in animal science (physiology focus). She was advised by Jerry Fitch.



**Caleb Lockard** graduated with a M.S. in animal science (nutrition focus). He was advised by Blake Wilson. His thesis was titled, "Impact of an Anti-Inflammatory Drug on Performance, Health and Carcass Characteristics of Steers, and In Situ Dry Matter and Starch Degradation of Processed Grains." He is currently pursuing a Ph.D. in Texas.



**Maria Chiara Perego** received her M.S. in animal science with a focus in reproductive physiology. She was advised by Dr. Leon Spicer. Her thesis was titled "Developmental and hormonal regulation of UHRF1 gene expression in ovarian granulosa and theca cells of cattle. Chiara is now pursuing her Ph.D. at Clemson University.



**Wentao Lyu** graduated with a Ph.D. in animal science (molecular biology focus). She was advised by Glenn Zhang. Her dissertation was titled, "Identification of host defense peptide-inducing compounds as alternatives to antibiotics using a cell-based high throughput screening assay." Wentao is now an assistant researcher at the

Zhejiang Academy of Agricultural Sciences.



**Carson Cooper** graduated with a M.S. in animal science (nutrition). She was advised by Scott Carter. Her thesis was titled, "The effects of phytogenic extracts and organic acids on growth performance of nursery and finishing pigs." She is now working as a research coordinator for Ralco Nutrition in Marshall, Minnesota.



**Morgan Pfeiffer** graduated with a Ph.D. in animal science (meat science focus). She was advised by Grechen Mafi. Her thesis was titled, "Quality attributes of grass- and grain-feed beef." She is now working as a marketing manager for the Oklahoma Beef Council.

## Visiting Scholars & Faculty



**Kyndal Reitzenstein** graduated with a M.S. in animal science (applied animal science focus). She was advised by Blake Bloomberg. Kyndal served as assistant coach for the livestock judging team.



**Will Ryan** graduated with a M.S. in animal science (nutrition focus). He was advised by Chris Richards.



**Shelby Spring** graduated with a M.S. in animal science (nutrition focus). She was advised by Adel Pezeshki. Her thesis was titled, "Effect of low protein diets supplemented with or without crystalline and branched-chain amino acids on energy balance, immune function, metabolomics profile and fecal microbiome of nursery pigs." She is now

working on her Ph.D. at the University of Wisconsin.



**Aksel Wiseman** graduated with a M.S. in animal science (nutrition focus). He was advised by David Lalman. His thesis was titled, "Effects of timing of weaning on energy utilization in primiparous beef cows and post-weaning performance of their progeny."



**Maggie Youngers** graduated with a Ph.D. in animal science (nutrition). She was advised by Chris Richards.

**Naveena Maheswarappa** (from the National Research Center on Meats in India) worked in Ranjith Ramanathan's lab from February to April, 2018, as part of a training program funded by the government of India. She trained in metabolomics and proteomics research.

**Thiago Belam** was a visiting scholar from Brazil in Ranjith Ramanathan's lab from February to August of 2018, where he received hands-on training in mitochondrial research. He is now a graduate student in our department.

**Binlong Chen**, a joint PhD student from Sichuan Agricultural University in China, completed his two-year study in Dr. Glenn Zhang's lab at OSU between Sep. 2016 – Oct. 2018. He was helping with the development of novel alternatives to antibiotics.

**Jing Wang**, an Associate Professor on leave from the Institute of Animal Science at Beijing Academy of Agricultural and Forestry Sciences in China, spent Aug. 2018 – Dec. 2018 in Dr. Glenn Zhang's lab at OSU on the development of antibiotic alternatives. Her visit to OSU was funded by Beijing Academy of Agricultural and Forestry Sciences in China.

**Ronnachai Prommachart** is a student from Khon Kaen University, Thailand, who visited our department for a six month training program funded by the Government of Thailand. Ronnachai completed research on black rice bran on ground beef quality in 2018.



Visit our website to learn more about research being conducted within the OSU Department of Animal and Food Sciences!

*Pictured are some of the animal and food science students in the UGRS program.*



# Undergraduates Gain Experience in Animal and Food Science Research

*By Ranjith Ramanathan*

Research programs are essential for gaining real-world hands-on experience through cutting-edge research. These skills can be invaluable to a student's future career. Research experience helps to reinforce the concepts students learn in the classroom. Additionally, students receive the opportunity to attend conferences and develop communication skills. Several of our students have presented their research at national conferences.

Undergraduate students can be involved in university-wide research programs at Oklahoma State

University and also the Undergraduate Research Scholar (UGRS) program within the department of animal and food sciences.

The university-wide programs include Freshman Research Scholar, Wentz, and Niblack. The Freshman Research Scholar program is for incoming students, while Wentz and Niblack are for the students who have completed a minimum of 12 credit hours at OSU and achieved a minimum 3.0 GPA. In university-wide programs, the students are responsible for finding their own research mentors, but the UGRS program assists students in finding

mentors who specialize in their field of interest. In addition, students can work in a lab if faculty members have research support.

Most students work with faculty and graduate student mentors. Mentors design research projects for students and also help train them to work in a lab. The majority of the students in the UGRS program had limited lab experience when they joined. Hence, a student may shadow a graduate student to gain necessary laboratory skills during the first few months. Once they gain confidence, they are involved with a smaller project before

starting an independent project. In general, most students master lab techniques within one semester.

Students can get involved in animal science or food science research, teaching, or extension projects. Some of the different research areas our students are involved in include animal genetics, nutrition, animal health, range and pasture, feedlot, swine, physiology, immunology, meat science, food chemistry, food microbiology, food safety, winemaking, and baking.

In recent years, animal genetics has been the number one choice for most students. If animal or food science faculty members are doing collaborative research with another department, such as entomology or the veterinary school, students will have opportunity to work outside of our department. There are numerous projects students can assist with, ranging from laboratory work to field studies.

If students are planning to go to professional schools, such as medical or veterinary, these experiences will give an edge in their application. Several students have published peer-reviewed papers in reputed journals as a first author, which is a remarkable achievement for our program and students. The students involved in these programs can also earn an Undergraduate Research Scholar transcript designation.

The UGRS program is unique as it allows students to stay in the program as long as they meet the expectations, whereas the university-wide program limits the student to be in the program for one year. We have students who have participated in the UGRS program for three years.

When a student starts, they need to work four hours a week and will be paid \$500 per semester. If they stay in the program for a longer time, they can work for six or eight hours per week and will be paid \$750 and \$1000 per semester, respectively. The students have to submit a progress report and are also required to submit Wentz or Niblack proposals.

Experience in the UGRS program is very beneficial to students who apply

for internships, jobs, or other research programs. In 2018, we had a record number of Wentz scholars selected from our department; approximately eight Wentz scholars out of 40 university-wide scholars.

Animal and food science students who have above a 3.0 GPA or higher are eligible to apply for the program. The students must be enrolled full-time (12+ hours per semester). Approximately 20 students are selected each year and are paired with a mentor based on their interests.

The main goals of the UGRS program are to engage promising undergraduates with a solid foundation in research methods to better prepare them for industry and/or academic careers in the animal science or food science, identify future leaders in the animal and food industry early in their career, and provide a well-rounded undergraduate educational experience.

Students can work with graduate students, in feedlots and different farms. The students will be better prepared for a career in industry or/

and academia. Several students have been admitted to the veterinary school, dental school, or medical school, as well as master's and Ph.D. programs. Participating in these research program helps to create a talented workforce for the livestock and food industry and can enhance the quality of research, which helps to solve industry challenges

Applications are accepted throughout the year and can be found on the departmental website. After turning in an application, the department of animal and food sciences will schedule a meeting to learn about a student's interests. The student will then meet with a faculty mentor to discuss potential research opportunities. If both the faculty member and student agree to work together, they will sign a contract and the student can start working in a lab. Students have the flexibility to change lab/mentor after one year to explore different research areas.

To apply or learn more about the UGRS program, visit our website at [afs.okstate.edu/research/ug](http://afs.okstate.edu/research/ug).



PHOTOS / REBEKAH ALFORD

*Sage Becker (left) and Samantha Howe (right) are both part of the Undergraduate Research Scholar Program. They are now a Goldwater Scholar and Niblack Research Scholar, respectively.*

# *Undergraduate Research Scholars* **DEPARTMENT OF ANIMAL AND FOOD SCIENCES**

Students in the Department of Animal and Food Sciences Undergraduate Research Scholars program gain hands-on experience through cutting-edge research completed alongside faculty, graduate students, technicians and research unit managers. There are numerous projects students can assist with, ranging from laboratory work to field studies.

## *How It Works*

### **APPLY**

Animal and food science students who have above a 3.0 GPA are eligible to apply.

### **APPROX. 20 STUDENTS ARE SELECTED EACH YEAR**

Students are paired with a mentor based on their research interests.

### **GAIN VALUABLE SKILLS**

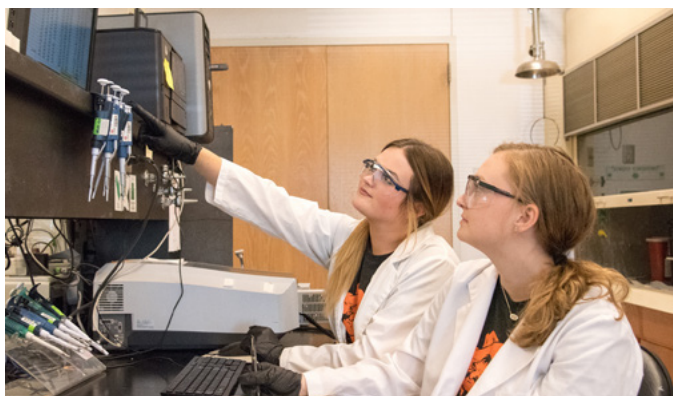
Mentors help students to navigate the research process and to develop critical thinking and communications skills.

### **OPPORTUNITY TO PRESENT RESEARCH**

Students have the ability to attend national meetings, publish peer-reviewed manuscripts in reputable journals and earn Undergraduate Research Scholar transcript designation.

### **FOR MORE INFORMATION CONTACT**

Dr. Ranjith Ramanathan  
405.744.9260  
ranjith.ramanathan@okstate.edu



### **FAST FACTS**

Participants have been admitted to graduate (Master's and Ph.D. programs), veterinary, dental and medical school.

### **HIGHLIGHTS**

Students have earned more than \$160,000 from more than 80 research awards and university wide scholar grants since 2012.



### **DEPARTMENT OF ANIMAL AND FOOD SCIENCES**

Oklahoma State University  
101 Animal Science | Stillwater, OK 74078  
405.744.6062 | afs.okstate.edu



# Undergraduate Research Scholars

*Below are AFS students currently involved in 2018 - 2019 undergraduate research programs.*

## **Emily Bechtold** (*Wentz Research Scholar*)

Mentor: Ranjith Ramanathan  
Project: Species specific myoglobin oxidation and reduction.

## **Sage Becker** (*Goldwater Scholar*)

Mentor: Glenn Zhang  
Project: Development of immune-boosting alternatives to antibiotics.

## **Logan Biggins**

Mentor: Adel Pezeshki  
Project: The effect of Herbanimal supplement as an alternative to antibiotic use on performance and total antioxidant capacity of broiler chickens.

## **Wyatt Catron**

Mentor: Darren Hagen  
Project: Determination of allelic variation responsible for dwarfism in Hampshire lambs.

## **Cameron Cavalliere**

Mentor: Udaya DeSilva  
Project: The effects of RNA factors on dark cutting beef.

## **Jordan Cowger** (*Wentz Research Scholar 2018-2019*)

Mentor: Glenn Zhang  
Project: Characterization of host-defense peptide inducing compounds in human HT29 cells.

## **Adelle Crofford**

Mentor: Darren Hagen  
Project: In vivo confirmation of cross-kingdom regulation.

## **Samantha Howe** (*Niblack Research Scholar*)

Mentor: Udaya DeSilva  
Project: Isolation and characterization of naturally occurring bacteria from equine uterus.

## **Larissa Kozlowski** (*Wentz Research Scholar*)

Mentors: Chris Richards  
Project: Beef cattle selection and management of adaptation to drought.

## **Cade Lemons**

Mentor: Peter Muriana  
Project: Antimicrobial validation of post-packing pasteurization of listeria monocytogens in packages of sliced turkey and ham.

## **Ty Montgomery**

Mentor: Glenn Zhang  
Project: Bioinformatic analysis of chicken gut microbiome associated with growth performance.

## **Jessie Payne** (*Wentz Research Scholar*)

Mentor: Danielle Bellmer  
Project: Encapsulation of algal proteins to improve sensory properties.

## **Charley Rayfield** (*Wentz Research Scholar*)

Mentor: Ravi Jadeja  
Project: Additive effects of paraacetic acid and sodium acid sulfate to reduce E. coli O157:H7 from beef trimmings.

## **Morgan Sarchet**

Mentors: Divya Jaroni  
Project: Biofilm-forming capabilities and dispersal of wild type E. coli O157:H7, using various chemical and bacteriophage treatments.

## **Madelyn Scott**

Mentor: Ranjith Ramanathan  
Project: Meat quality parameters with different pH levels.

## **Angelica Smith**

Mentor: Andrew Foote  
Project: Insulin signaling and growth efficiency in beef cattle.

## **Nicole Stevenson**

Mentors: Blake Wilson & Janeen Salak-Johnson  
Project: Metaphylaxis in beef cattle

## **Sarah Vue** (*Wentz Research Scholar*)

Mentor: Glenn Zhang  
Project: Natural antibiotic alternatives to boost animal immunity and disease resistance.

# Herbal Extracts as Antibiotic Alternatives for Broiler Chickens

By Jacob Burch-Konda

For my undergraduate research project, I am testing the potential of herbal supplements as a replacement for antibiotics in poultry feed. My study is specifically focused on the effects of herbal supplements on performance and oxidative stress status of broiler chickens raised to market weight. I've been involved with similar studies with swine since becoming an Undergraduate Research Scholar and am excited about working with a new species.

The goal of my research is to help identify safe and effective alternatives to antibiotics in poultry feed. I hope my research results in healthier birds that perform better at fighting off disease. I'm very interested in this research project because the issue of antibiotic resistant bacteria has gained a lot of attention in recent years.

Low doses of antibiotics in animal feed is used to prevent disease and improve performance, but it has been identified as contributors to the problem, so it is exciting to be involved in research that moves us closer to a solution. As antibiotics in animal feeds continue to be limited or banned we need safe and effective alternatives, which is where herbal supplements come into play. I'm grateful that my advisor Dr. Adel Pezeshki is involved in such interesting research and has directed me towards looking into similar issues regarding animal nutrition.

Our research started with 120, day-of-hatch, male boiler chickens divided into two different treatment groups. Half of the birds received a standard antibiotic supplemented commercial diet with tap water while the other half received a standard commercial diet without antibiotic, plus herbal supplement offered via drinking water. The study lasted 42 days, with the broilers' weights and feed intake measured weekly.

At the end of the study, blood and liver samples were collected to

determine the oxidative stress status of the chicken. Our earlier analysis have suggested that herbal extract supplementation results in higher total antioxidant capacities than antibiotics in the birds, which is important in determining their ability to fight off diseases.

## About Jacob Burch-Konda

Jacob is an undergraduate research scholar in the OSU Department of Animal and Food Sciences. Jacob is excited to gain hands-on experience in research and use the concepts he has learned in the classroom. As an undergraduate, he has had an opportunity to work at farms units and in the lab. Jacob has enjoyed the

opportunity to see the different sides of research.

"It is exciting to be able to start my own project now that I've spent the last few months learning about all the tests we run as part of the experiments," Jacob said. "Being a part of the program has definitely made me more passionate about research and led me to consider it in my future academic plans."

Jacob plans to either attend veterinary school or pursue a master's degree following graduation. His goal is to focus on large animals in future academic/career plans. He would like to return to his home state (California) to further his education, but says he is open to experiencing new places.



*Jacob Burch-Konda is an animal science major and Undergraduate Research Scholar.*

PHOTO / REBEKAH ALFORD



# Efficacy of Sodium Acid Sulfate to Reduce Foodborne Pathogens From Bell Peppers

By Charley Rayfield

My research project focuses on the uses of Sodium Acid Sulfate (SAS) as a produce sanitizer for chopped bell peppers. The study evaluates the efficacy of various concentrations of SAS and the quality impacts it may have on the bell peppers. Evaluating each part of the process from the mode of action of the sanitizer to the quality impacts are critical for ensuring that SAS could be used in the produce industry as an effective and safe antimicrobial.

I chose this particular area of research because of its importance to the food industry. Antimicrobial research is vital to maintaining the safety of our food supply. Current industry standards consist of produce being washed in water that is re-circulated before being packaged. Since the water is re-circulated, it contains a higher concentration of organic matter. Many antimicrobials are sensitive to organic matter; therefore, there is a need for antimicrobials, such as Sodium Acid Sulfate, that are not sensitive to organic matter. With trends lending towards more produce consumption, it is very important for us to take the right steps in controlling pathogenic bacteria so that raw produce does not carry as much risk. Studying novel antimicrobials will keep the industry moving towards maintaining high safety standards.

The goal of the research is to evaluate new and novel methods for controlling pathogenic microorganisms by evaluating Sodium Acid Sulfate as a sanitizer. To do this, I'm looking at its capability of eliminating pathogenic bacteria from produce when there is a high level of organic matter in the wash. With many people deciding to eat more raw fruits and vegetables, it is important that proper precautions are being taken to ensure the safest product is on the shelves for consumers.

During this project, fresh bell peppers were chopped to produce



approximately 1 in<sup>2</sup> pieces. Individual pieces of bell pepper were inoculated by placing 50 µl of 7 Log CFU/ml *E. coli* O157:H7 or *Salmonella* Typhimurium DT104. After inoculation, individual bell pepper pieces were allowed to air dry in a laminar flow hood for 60 min. Two pieces of inoculated bell pepper were subjected to one of five treatments; 3% SAS or 80 mg/L peracetic acid (PAA), PAA+SAS, SAS + sodium dodecyl sulfate (0.5%), deionized water (W) and no treatment (NT) by submerging them into 25 mL of treatment solution for 1 minute. At the end of each treatment, bell peppers, and treatment solutions were analyzed for the presence of targeted pathogens. Each experiment was repeated at least three times.

After the treatment, reductions of 1.23, 1.61, 1.68, 2.16 and 1.01 Log CFU/in<sup>2</sup> for PAA, SAS, PAA+SAS, SAS+SDS, and W were observed, respectively. For *S. Typhimurium*, reductions of 1.41, 1.87, 2.22 Log CFU/in<sup>2</sup> were observed for W, PAA and PAA+SAS treatments. Treatments SAS and SAS+SDS were able to reduce *S. Typhimurium* to non-detectable levels (>2.95 Log CFU/in<sup>2</sup>).

When treatment solutions were tested for the presence of the target pathogen, except for the DI water treatment, no pathogens were detected by direct plating. But, after

enrichment, PAA treatment solution tested positive for targeted pathogens. SAS could become an effective alternate produce wash sanitizer which could provide protection against microbial cross-contamination during washing.

## About Charley Rayfield

Beginning her freshman year, Charley has been part of the undergraduate research scholar program in the OSU Department of Animal and Food Sciences. This program enabled her to get involved in research early on and helped expand her views on research. This year she was selected as a Wentz research scholar. Charley has been involved in multiple projects studying the use of antimicrobials on ground beef and produce.

"Having the opportunity to be a part of the undergraduate research program has opened many doors for me, and research has better prepared me to one day work in the food industry," Charley said.

Upon graduation in May of 2019, Charley will be staying at OSU to complete her master's degree under the guidance of Dr. Ravi Jadeja, who specializes in the area of food safety. In the future, Charley would like to work for the food industry in an area that works closely with food safety regulations.

# Isolation and Characterization of Naturally Occurring Bacteria from Equine Uterus

By Samantha Howe

My current project is focused on characterizing the microbiome of the equine uterus. During my time as an Animal Science Research Scholar in Dr. Udaya DeSilva's laboratory, I helped with a project aimed at identifying bacterial species that inhabit healthy equine (horse) uteri.

There are numerous steps involved in this project. I start by receiving uterine fluid samples from healthy mares. Next, I plate the samples onto both Blood and MacConkey agar plates. Once I have bacterial growth, I perform single colony purification and send each culture to the Oklahoma Animal Disease Diagnostics Lab (OADDL) to be identified. If the lab is unable to identify the samples, I culture them in Terrific Broth. Once growth occurs, I perform DNA extraction. Next, I perform PCR regions on V1-V9 of the 16s ribosomal RNA. Upon completion, I send the samples for sequencing.

The study identified 160 different genera of bacteria that live in the uteri of healthy mares. Some of

these organisms have never been reported before and none have ever been reported in the uteri of mares. I am interested in two of these organisms that sometimes represent 50% or more of the bacteria found in some mares. One is an organism that belongs to the genus *Pseudomonas* and the other is an organism that belongs to the genus *Terisoporobacter*.

I am interested in the *Pseudomonas* organism because of another bacterium belonging to the same genus, *Pseudomonas aeruginosa*. *Pseudomonas aeruginosa* is a known pathogen in human and animal reproductive tracts, however the *Pseudomonas* sp. I am studying seems to thrive in healthy animals. In addition, I am also interested in *Terisoporobacter*, because it has never before been reported in an animal.

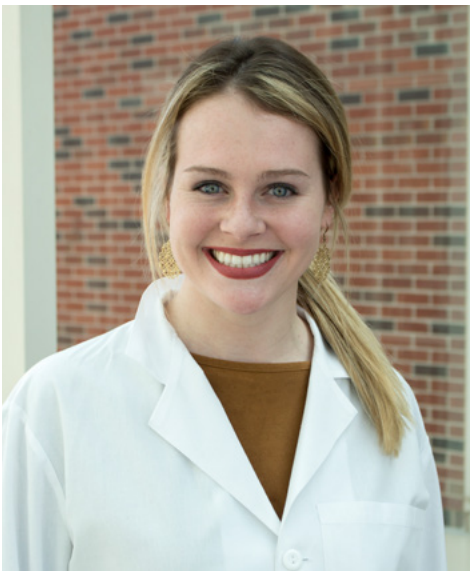
The goal of my current research project is to biochemically and microbiologically characterize microbial populations in healthy equine uteri in order to determine their

function and purpose. In doing so, I hope these organisms could someday be used as probiotics in mammalian reproductive tracts to treat issues like infertility and endometriosis.

The mammalian uterus has always been considered a sterile, pristine environment to be able to sustain a fetus. Any indication of the presence of an extraneous organism called for intervention with broad-spectrum antibiotics and antifungal agents. This paradigm has recently been challenged by the observation of commensal bacteria in healthy human placenta. Subsequently, many laboratories (including the laboratory I work in) have proven that a dynamic bacterial population exists in the uteri of several mammalian species. However, the current veterinary/medical approaches call for comprehensive antibiotic treatment of uteri at the first indication of infection. The function, if any, of most of these bacteria are not known at this time. My research is important because if I am successful, these organisms could someday be used as probiotics in mammalian reproductive tracts.



PHOTOS / REBEKAH ALFORD



### About Samantha Howe

In addition to the Niblack Research Scholar program, Samantha has also been involved in the AFS Undergraduate Research Scholar program. Samantha believes this program was incredibly beneficial to her undergraduate research career by providing her the opportunity to discover her passion for research.

During the summer of 2018, Samantha served as a Summer Undergraduate Research Fellow at the University of Texas Southwestern Medical Center in Dallas, Texas. During this time, she worked in the McFadden Laboratory in the Departments of Biochemistry, Endocrinology, and Internal Medicine. At UTSW, she had a multitude of responsibilities and projects, but the research project she worked on focused on Ewing Sarcoma, a rare form of cancer that affects the bone and surrounding soft tissue in children.

After graduation, Samantha plans to continue her education by attending graduate school. Her long-term goal is to remain in academia as a research scientist and professor. Samantha says she has a passion for science and knowledge that she hopes to pass on to the next generation of students.

“My mentors have continuously encouraged me and challenged me to reach my full potential,” Samantha said. “This empowerment has given me the confidence to reach for my dreams, no matter how lofty they may be. I hope to challenge and empower the next generation of students, as I have been.”



# 2019 Research Grants

*Below are grant funded projects in the Oklahoma State University Department of Animal and Food Sciences for 2019.*

## **ABI development: A genomic data mining resource to accelerate genome-to-phenome discovery in domesticated animals.**

Researcher: Darren Hagen\* (PI).

Grant Funding: University of Missouri. 8/15/18 - 7/31/22. \$64,040.

## **Antimicrobial ice based meat grinder sanitation process optimization.**

Researcher: Ravi Jadeja\* (PI).

Grant Funding: TBDP/OSU. 11/1/17 - 11/30/19. \$5,500.

## **ARS meat quality.**

Researcher: Deb VanOverbeke\* (PI).

Grant Funding: USDA ARS El Reno. 9/1/14 - 8/31/19. \$60,000.

## **Back to Basics: Expanding best management practice adoption in small and mid-sized beef enterprises.**

Researcher: David Lalman\* (PI).

Grant Funding: USDA. 5/1/17 - 4/30/21. \$109,025.

## **Beef cattle selection and management for adaptation to drought.**

Researcher: Chris Richards\* (PI), Udaya DeSilva\* (Co-PI), and Deb VanOverbeke\* (Co-PI).

Grant Funding: USDA. 5/1/14 - 4/30/19. \$999,999.

## **Comparing enzyme efficiency on total tract starch digestibility.**

Researchers: Chris Richards\* (PI), Ryan Reuter\* (Co-PI), and Blake Wilson\* (Co-PI).

Grant Funding: Dupont/ Danisco Animal Health. 1/4/18 - 8/31/20. \$124,916.

## **Customized food-safety intervention strategies for hard-to-reach producers.**

Researcher: Ravi Jadeja\* (PI).

Grant Funding: Texas Organic Farmers and Growers Association. 10/1/16 - 8/31/19. \$52,709.

## **Dietary effects on sow productivity to three parties.**

Researcher: Janeen Salak-Johnson\* (PI).

Grant Funding: USDA. 2/9/18 - 3/30/19. \$23,696.

## **Effect of heat stress on broiler chickens medicated with different concentrations of nicarbazin.**

Researchers: Glenn Zhang\* (PI) and Adel Pezeshki\* (Co-PI).

Grant Funding: Elanco Animal Health. 11/17/17 - 5/16/20. \$52,937.

## **Effects of a Herbanimal supplement as an alternative to antibiotic use in broiler chickens' performance, carcass composition, and immune status.**

Researchers: Ali Beker<sup>§</sup> (PI), Adel Pezeshki\* (Co-PI), Julia Sutton<sup>¶</sup>, and Jacob Burch-Konda<sup>¶</sup>.

Grant Funding: Herbanimals Supplements. 8/1/17 - 12/31/19. \$23,000.

## **Effects of zinc source and concentration on growth performance of nursery pigs.**

Researchers: Scott Carter\* (PI), Pompim Aparachita<sup>¶</sup>, Afton Sawyer<sup>¶</sup>, and Jared Harshman<sup>¶</sup>.

Grant Funding: Zinpro Corp. 1/1/19 - 12/31/19. \$30,229.

## **Endocrine adaptation of beef cattle during long-term water restriction.**

Researchers: Blake Wilson\* (PI), Kelsey Bruno<sup>¶</sup>, and Larissa Kozlowski<sup>¶</sup>.

Grant Funding: Texas Cattle Feeders Association. 12/17/18 - 6/16/20. \$5,000.

## **Evaluation of implant strategies in extended grazing periods.**

Researcher: Ryan Reuter\* (PI).

Grant Funding: Elanco Animal Health. 10/1/18 - 2/28/20. \$86,400.

*Key: 2018-2019 OSU AFS Faculty\*, Staff<sup>§</sup>, Graduate Students<sup>¶</sup>, Undergraduate Students<sup>¶</sup>*

**Evaluation of mintrex beef chelated trace minerals on clinical signs, immune response variables, and mineral balance in calves following natural exposure to bovine viral diarrhea virus type 1b and subsequent Mannheimia haemolytica infection.**

Researcher: Chris Richards\* (PI).

Grant Funding: NOVUS International, Inc. 12/1/12 - Completion. \$31,591.40.

**Fecal microbiota transplantation to enhance production efficiency.**

Researchers: Kelsy Robinson<sup>g</sup> (PI) and Glenn Zhang\*.

Grant Funding: USDA. 4/1/18 - 3/31/20. \$95,000.

**Food and Agricultural Sciences National Needs Graduate Fellowship Grant Program.**

Researchers: Dani Bellmer (PI), Peter Muriana\* (Co-PI), Divya Jaroni\* (Co-PI), Ravi Jadeja\* (Co-PI), and William McGlynn (Co-PI).

Grant Funding: USDA-AFRI. 8/1/17 - 7/31/21. \$41,000.

**Gastric ulcers.**

Researchers: Steven Cooper\* (PI).

Grant Funding: Mannsville Ag Center. 3/01/19 - Completion. \$10,661.70.

**Improving the efficiency of antimicrobial use in feedlot calves and refining treatment protocols for undifferentiated fever using a chute-side diagnostic tool.**

Researchers: Blake Wilson\* (PI), Paul Beck\*, Ryan Reuter\*, Colton Robison<sup>g</sup>, and Andrea Northup-Warner<sup>g</sup>, Kaitlyn Pierce<sup>g</sup>, and Nicole Stevenson<sup>u</sup>.

Grant Funding: Industry Funding. 9/1/18 - 8/31/19. \$56,918.

**Improving the growth performance of nursery pigs with low protein diets supplemented with both crystalline and branched chain amino acids.**

Researchers: Adel Pezeshki\* (PI), Ranjith Ramanathan\*, Ed Lucas, Prasanth Chelikani, Scott Carter\*, Mohammad Habibi<sup>g</sup>, Monique Randhawa<sup>u</sup>, Tanner Strunk<sup>u</sup>, Chelsea Shelton<sup>u</sup>, and Autumn Gregg<sup>u</sup>.

Grant Funding: NIFA. 1/1/18 - 12/31/19. \$150,000.

**Interaction of dietary Herbanimal supplement with protein to improve the performance and health of nursery pigs.**

Researchers: Adel Pezeshki\* (PI), Cedrick Shili<sup>g</sup>, Tanner Strunk<sup>u</sup>, Chelsea Shelton<sup>u</sup>, and Autumn Gregg<sup>u</sup>.

Grant Funding: Herbanimals Supplements. 4/1/18 - 9/30/19. \$17,327.

**Meat science – Graduate student research assistantship.**

Researcher: Deb VanOverbeke\* (PI).

Grant Funding: Oklahoma Beef Council. 10/1/18 - 9/30/19. \$15,000.

**Multisorb.**

Researcher: Deb VanOverbeke\* (PI).

Grant Funding: Multisorb Technologies, Inc. 3/1/15 - 2/28/20. \$389,435.

**Natural 'green label' fermentates from lactic acid bacteria to inhibit Listeria monocytogenes and Clostridium sporogenes (spores) on low- and high-fat beef hotdogs.**

Researchers: Peter Muriana\* (PI), Dennis Pletcher<sup>g</sup>, and Arjun Bhusal<sup>g</sup>.

Grant Funding: Foundation for Meat and Poultry Research and Education. 4/01/18 - 9/30/19. \$32,711.

**Novel non-antibiotic approaches for mitigation of antimicrobial resistance in poultry.**

Researchers: Glenn Zhang\* (PI), J. Lin, Q. Zhong, T. Tabler, and W. Zhai.

Grant Funding: University of Tennessee. 1/15/18 - 1/14/21. \$290,419.

**Packaging to improve appearance of dark-cutting beef.**

Researchers: Ranjith Ramanathan\* (PI), Gretchen Mafi\*, Steve Hartson, Deb VanOverbeke\*, Ravi Jadeja\*, Morgan Denzer<sup>g</sup>, Frank Kiyimba<sup>g</sup>, Thiago Belem<sup>g</sup>, and Emmy Bechtold<sup>u</sup>.

Grant Funding: OCAST. 8/1/18 – 7/31/19. \$45,000.

**Performance and profitability of long-acting Eprinomectin (Long Range) in stocker steers grazing wheat pasture.**

Researcher: Ryan Reuter\* (PI).

Grant Funding: Merial, LTD. 5/1/17 - 9/30/19. \$168,009.

**Recovery of orally-dosed Priproxyfen from cattle manure.**

Researcher: Ryan Reuter\* (PI).

Grant Funding: Mclaughlin Gormley King. 10/1/18 – 2/29/19. \$24,894.

**Resilience and vulnerability of beef cattle production in the Southern Great Plains under changing climate, land use, and markets.**

Researcher: David Lalman\* (PI).

Grant Funding: KSU (USDA Climate Change). 8/1/14 - 7/31/19. \$345,110.

**Resilience and vulnerability of beef cattle production in the Southern Great Plains under changing climate, land use, and markets.**

Researcher: Ryan Reuter\* (PI).

Grant Funding: KSU (USDA Climate Change). 8/1/14 - 7/31/19. \$134,939.48.

**Role of metmyoglobin reducing activity in beef color.**

Researchers: Ranjith Ramanathan\* (PI) and Laura Yoder <sup>g</sup>.

Grant Funding: USDA. 8/1/17 – 7/31/19. \$149,980.

**Screening and evaluation of the OSU/FAPC culture collection and new animal isolates (FAPC slaughter) to identify probiotic cultures of value.**

Researchers: Peter Muriana\* (PI), Caitlin Karolenko <sup>g</sup>, and Arjun Bhusal <sup>g</sup>.

Grant Funding: Office of Technology and Business Development, OSU. 5/1/18-5/1/20. \$30,000.

**Seahorse XFp Oxygen analyzer to enhance mitochondrial research capabilities in meat quality studies.**

Researchers: Ranjith Ramanathan\* (PI), Adel Pezeshki\* (Co-PI), Scott Carter\* (Co-PI), Gretchen Mafi\* (Co-PI), David Lalman\* (Co-PI), Chris Richards\* (Co-PI), and Deb VanOverbeke\* (Co-PI).

Grant Funding: USDA/AFRI. 1/1/18 - 1/1/19. \$22,832.

**Short pilot trial for the intake of free-choice mineral by grazing pasture cattle.**

Researcher: Paul Beck\* (PI).

Grant Funding: Pharmgate. 10/1/18 - 9/30/19. \$21,268.

**Sustainable beef-forage systems for the Southern Plains.**

Researcher: Ryan Reuter\* (PI).

Grant Funding: USDA ARS. 8/1/15 - 7/30/20. \$73,621.

**Sustaining beef production in the Southern Plains through managing greenhouse gas emissions by grazing cattle.**

Researcher: Ryan Reuter\* (PI).

Grant Funding: USDA ARS. 9/1/15 - 7/31/20. \$77,685.

**Updating and upgrading the Oklahoma State University Animal Nutrition and Behavior Laboratories.**

Researchers: Andrew Foote\* (PI), Paul Beck\*, Scott, Cater\*, Laura Goodman, Janeen Salak-Johnson\*, Dave Lalman\*, Adel Pezeshki\*, Ryan Reuter\*, Alex Rocateli, and Blake Wilson\*.

Grant Funding: OSU Vice President for Research. 3/20/19 – 6/20/20. \$232,680.

**Use of a bovine overgrowth syndrome to characterize the molecular etiology of BWS.**

Researcher: Darren Hagen\* (PI).

Grant Funding: University of Missouri. 3/1/18 – 4/29/21. \$21,507.

**Validation of Decon7 against Pseudomonas aeruginosa and Staphylococcus aureus biofilms.**

Researcher: Peter Muriana\* (PI).

Grant Funding: Decon7 Systems. 8/1/18 – 7/31/20. \$30,000.

**Whole-chain traceability to improve food safety: Melons.**

Researcher: Ravi Jadeja\* (PI).

Grant Funding: ODAFF. 1/9/17 - 9/29/19. \$21,076.

# 2018 Research Publications

## **Analyzing beef color stability differences with metabolomics.**

A. Abraham <sup>¶</sup>, J.W. Dillwith, D.L. VanOverbeke\*, G.G. Mafi\*, and R. Ramanathan\*.  
Meat and Muscle Biology, 1(2), 157-157.

## **Behavioral responses of laying hens to atmospheric ammonia in an environmental chamber.**

C. Tucker, A.R. Green-Miller, R.S. Gates, S. Myint, and J.L. Salak-Johnson\*.  
American Society Agricultural Biological Engineers. doi: 10.13031/iles.18-106

## **Bovine genome database: Tools for mining the bos taurus genome.**

D.E. Hagen\*, D.R. Unni, A. Tayal, G.W. Burns, and C.G. Elsik.  
Eukaryotic Genomic Databases, 211-249.

## **Branched chain amino acids: Beyond nutrition metabolism.**

C. Nie, T. He, W. Zhang, G. Zhang\*, and X. Ma.  
International journal of molecular sciences 19(4), 954.

## **Butyrate: A double-edged sword for health?**

H. Liu, J. Wang, T. He, S. Becker <sup>U</sup>, G. Zhang\*, D. Li, and X. Ma.  
Advances in Nutrition, 9(1), 21-29.

## **Case study: Effects of body weight gain and bovine somatotropin treatment of postpartum beef cows on concentrations of IGF-1, insulin, and glucose in blood plasma; luteal activity; and calf growth.**

M.J. Cooper-Prado, I. Rubio, N.M. Long, M.P. Davis, L.J. Spicer\*, and R.P. Wettemann\*.  
The Professional Animal Scientist, 34(5), 513-521.

## **Changes in the U.S. cowherd and their implications on heifer development.**

D.L. Lalman\*, A.L. McGee <sup>¶</sup>, C.M. Spencer <sup>¶</sup>, and A.R. Wiseman <sup>¶</sup>.  
Journal of Animal Science, 96, 25-26.

## **Characterization of bacteriophages targeting non-O157 shiga toxigenic escherichia coli.**

P.K. Litt <sup>¶</sup>, J. Saha <sup>¶</sup>, and D. Jaroni\*.  
Journal of Food Protection, 81(5), 785-794.

## **Comparative biogeography of the gut microbiome between jinhua and landrace pigs.**

Y. Xiao, F. Kong, Y. Xiang, W. Zhou, J. Wang, H. Yang, G. Zhang\*, and J. Zhao.  
Scientific Reports, 8(1), 5985.

## **Cooking for individuals with food allergies and intolerances.**

T. LaLonde and R. Jadeja\*.  
Madridge J Food Tech., 3(1), 115-121.

## **Determination of the efficacy of titrated levels of water soluble zinc amino acid complex on growth performance of nursery pigs.**

P. Aparachita <sup>¶</sup>, S.D. Carter\*, C.V. Cooper <sup>¶</sup>, I.S. Lara <sup>¶</sup>, A. Sawyer <sup>¶</sup>, Z.J. Rambo, et al.  
Journal of Animal Science, 96, 134.

## **Determination of the efficacy of titrated levels of water soluble zinc amino acid complex on immune response of nursery pigs.**

P. Aparachita <sup>¶</sup>, S.D. Carter\*, C.V. Cooper <sup>¶</sup>, I. Silva Lara <sup>¶</sup>, A. Sawyer <sup>¶</sup>, Z.J. Rambo, and T.L. Ward.  
Journal of Animal Science, 96(2), 120-121.

## **Development of a cell-based high-throughput screening assay to identify porcine host defense peptide-inducing compounds.**

Z. Deng <sup>¶</sup>, J. Wang, W. Lyu <sup>¶</sup>, X. Wieneke, R. Matts, X. Ma, and G. Zhang\*.  
Journal of Immunology Research. Retrieved from <https://doi.org/10.1155/2018/5492941>.

## **Dietary clostridium butyricum induces a phased shift in fecal microbiota structure and increases the acetic acid-producing bacteria in a weaned piglet model.**

J. Zhang, X. Chen, P. Liu, J. Zhao, J. Sun, W. Guan, L.J. Johnston, C. Levesque, P. Fan, T. He, G. Zhang\*, and X. Ma.  
Journal of Agricultural and Food Chemistry, 66(20), 5157-5166.

## **Dietary modulation of endogenous host defense peptide synthesis as an alternative approach to in-feed antibiotics.**

K. Robinson <sup>¶</sup>, X. Ma, Y. Liu, S. Qiao, Y. Hou, and G. Zhang\*.  
Animal Nutrition, 4(2), 160-169.

## **Effect of dietary source and concentrations of copper, manganese, and zinc on growth performance and immune response of nursery pigs following an acute lipopolysaccharide challenge.**

S. Schaaf, S.D. Carter\*, C.V. Cooper <sup>¶</sup>, P. Aparachita <sup>¶</sup>, I. Silva Lara <sup>¶</sup>, C. Shili <sup>¶</sup>, K.R. Perryman, and J.L. Usry.  
Journal of Animal Science, 96(2), 135-136.

**Effect of exogenous progesterone or flunixin meglumine after AI on serum progesterone concentration and pregnancy per AI in lactating dairy cows.**

S. Barkhori-Mehni, H. Karami-Shabankareh, R. Masoumi, M. Kazemi-Bonchenari, A. Pezeshki\*, A. Badiiei, E. Dirandeh, and M.G. Colazo.  
Animal Reproduction, 15(2), 140-147.

**Effect of melatonin on bovine theca cells in vitro.**

T. Feng, L.F. Schutz, B.C. Morrell, M.C. Perego<sup>o</sup>, and L.J. Spicer\*.  
Reproduction, Fertility and Development, 30, 643-650.

**Effect of temperament measures on feedlot cattle performance.**

K. Bruno<sup>o</sup>, L.J. McPhillips, M. Calvo-Lorenzo, U. Desilva\*, C.R. Krehbiel, M.M. Rolf, S.E. Place, D.L. Step, R.G. Mateescu, D.L. VanOverbeke\*, and T.C. Husz<sup>o</sup>.  
Journal of Animal Science, 96(1), 18-19.

**Effects of a chronic lipopolysaccharide challenge on growth performance and immune response of nursery pigs fed differing sources and concentrations of copper, manganese, and zinc.**

I.S. Lara<sup>o</sup>, S.D. Carter\*, C.V. Cooper<sup>o</sup>, P. Aparachita<sup>o</sup>, K.R. Perryman, and J.L. Usry.  
Journal of Animal Science, 96, 136.

**Effects of dietary vitamin E and selenium on growth performance and immune response of nursery pigs following an immune challenge.**

C. Shili<sup>o</sup>, S.D. Carter\*, S. Schaaf<sup>o</sup>, C.V. Cooper<sup>o</sup>, I. Silva Lara<sup>o</sup>, and P. Aparachita<sup>o</sup>.  
Journal of Animal Science, 96(2), 115-116.

**Effects of display time on mitochondrial and cytochrome C content in beef longissimus and psoas muscles.**

Y. Ke, A. Abraham<sup>o</sup>, G.G. Mafi\*, D. Vanoverbeke\*, and R. Ramanathan\*.  
Meat and Muscle Biology, 1(2), 154.

**Effects of exercise and roughage source on the health and performance of receiving beef calves.**

M.A. Woolsoncroft, M.E. Youngers<sup>o</sup>, L.J. McPhillips, C.G. Lockard<sup>o</sup>, C.L. Haviland<sup>o</sup>, E.S. DeSocio<sup>o</sup>, W.R. Ryan<sup>o</sup>, C.J. Richards\*, B.K. Wilson\*, et al.  
The Professional Animal Scientist, 34(2), 183-191.

**Effects of inclusion of spray-dried porcine plasma in lactation diets on sow and litter performance.**

S.D. Carter\*, M.D. Lindemann, L.I. Chiba, M.J. Estienne, and G. Lima.  
Livestock Science, 216, 32-35.

**Effects of marbling and postmortem aging on consumer assessment of United States lamb loin.**

M.R. Phelps, A.J. Garmyn, J.C. Brooks, G.G. Mafi\*, S.K. Duckett, J.F. Legako, et al.  
Meat and Muscle Biology, 2(1), 221-232.

**Effects of N-carbamylglutamate and L-arginine on steroidogenesis and gene expression in bovine granulosa cells.**

T. Feng, L.F. Schütz, B.C. Morrell, M.C. Perego<sup>o</sup>, and L.J. Spicer\*.  
Animal Reproduction Science, 188, 85-92.

**Effects of oral administration of lipopolysaccharide on growth performance and immune response of nursery pigs.**

I. Silva Lara<sup>o</sup>, S.D. Carter\*, C.V. Cooper<sup>o</sup>, P. Aparachita<sup>o</sup>, C. Shili<sup>o</sup>, and J.L. Usry, et al.  
Journal of Animal Science, 96(2), 209.

**Effects of Outpace<sup>o</sup> and Ambitine<sup>o</sup> feed additives on the performance of wean-to finish pigs.**

C.V. Cooper<sup>o</sup>, S.D. Carter\*, P. Aparachita<sup>o</sup>, and I. Silva Lara<sup>o</sup>.  
Journal of Animal Science, 96(2), 185.

**Effects of Outpace<sup>TM</sup> feed additive on nursery pig performance.**

C.V. Cooper<sup>o</sup>, S.D. Carter\*, and P. Aparachita<sup>o</sup>.  
Journal of Animal Science, 96, 117.

**Effects of packaging, antioxidants, and Nadh on ground beef color and oxidation reduction potential.**

R.M. Mitacek, R. Ramanathan\*, D.L. VanOverbeke\*, G.G. Mafi\*, K. Brennecke, et al.  
Meat and Muscle Biology, 1(2), 163.

**Effects of pomegranate rind extract on ground beef color.**

K.M. Wills, H.J. Nelson, S. Bhargava, A. Abraham<sup>o</sup>, G.G. Mafi\*, D.L. VanOverbeke\*, et al.  
Meat and Muscle Biology, 1(2), 142.

**Effects of ractopamine hydrochloride on slice shear force within USDA quality grade of feedlot holstein steers.**

T.C. Husz<sup>o</sup>, C.J. Richards\*, C. L. Haviland<sup>o</sup>, M. J. Corbin, and C.R. Krehbiel.  
Journal of Animal Science, 96(2), 270.

**Effects of timing of weaning on calf performance and maintenance energy requirements in primiparous beef cows.**

A.R. Wiseman<sup>o</sup>, M.D. Redden, C.M. Spencer, A.L. McGee<sup>o</sup>, R.R. Reuter\*, et al.  
Journal of Animal Science, 96, 12-13.



**Environmental effects on water intake and water intake prediction in growing beef cattle.**

C.M. Ahlberg, K. Allwardt, A. Broocks, K. Bruno <sup>¶</sup>, L. McPhillips, A. Taylor, C.R. Krehbiel, M.S. Calvo-Lorenzo, C.J. Richards\*, S.E. Place, U. DeSilva\*, D.L. VanOverbeke\*, et al.  
Journal of Animal Science, 96(10), 4368-84.

**Essential oils improved weight gain, growth and feed efficiency of young dairy calves fed 18 or 20% crude protein starter diets.**

M. Kazemi-Bonchenari, R. Falahati, M. Poorhamdollah, S.R. Heidari, and A. Pezeshki\*.  
Journal of Animal Physiology and Animal Nutrition, 102(3), 652-661.

**Evaluation of net returns to risk and management in an intensified cow-calf production system.**

A.L. McGee <sup>¶</sup>, J.R. Cole, C.L. Bayliff, M.D. Redden, C.M. Spencer, A.R. Wiseman <sup>¶</sup>, J.G. Warren, R.R. Reuter\*, D. Doye, G.W. Horn\*, and D.L. Lalman\*.  
Journal of Animal Science, 96(1), 52.

**Frequencies and severity of injection-site lesions in muscles from rounds of cow carcasses.**

M.M. Pfeiffer <sup>¶</sup>, G.G. Mafi\*, R. Ramanathan\*, T.M. Neilson, and D.L. VanOverbeke\*.  
Translational Animal Science, 3(1).

**Fusarium molds and mycotoxins: potential species-specific effects.**

A. Bertero, A. Moretti, L. Spicer\*, and F. Caloni.  
Toxins, 10(6), 244.

**Fusarium mycotoxins and in vitro species-specific approach with porcine intestinal and brain in vitro barriers: A review.**

A. Bertero, L.J. Spicer\*, and F. Caloni.  
Food and Chemical Toxicology, 121, 666-675.

**Gut microbiota is a major contributor to adiposity in pigs.**

H. Yang, Y. Xiang, K. Robinson <sup>¶</sup>, J. Wang, G. Zhang\*, J. Zhao, and Y. Xiao.  
Frontiers in Microbiology, 9, 3045.

**High throughput screening for natural host defense peptide-inducing compounds as novel alternatives to antibiotics.**

W. Lyu <sup>¶</sup>, Z. Deng, L.T. Sunkara, S. Becker <sup>¶</sup>, K. Robinson <sup>¶</sup>, R. Matts, and G. Zhang\*.  
Frontiers in Cellular and Infection Microbiology. doi: 10.3389/fcimb.2018.00191

**Housing pregnant sows in turnaround stalls during gestation impacts behavior, immune and well-being.**

A. DeDecker, M. Mandru, and J.L. Salak-Johnson\*.  
American Journal of Animal and Veterinary Sciences, 13(4), 123-129.

**Hymenoptera genome database: Using HymenopteraMine to enhance genomic studies of hymenopteran insects.**

C.G. Elsik, A. Tayal, D.R. Unni, G.W. Burns, and D.E. Hagen\*.  
Eukaryotic Genomic Databases, Methods in Molecular Biology, 1757, 513-556.

**In vitro effects of two environmental toxicants, beauvericin and glyphosate in Roundup, on cell proliferation and steroidogenesis using a novel bovine whole ovarian cell culture system.**

F. Caloni, M.C. Perego <sup>¶</sup>, C. Cortinovis, A. Bertero, and L.J. Spicer\*.  
Journal of Veterinary Pharmacology and Therapeutics, 41(1), 103-104.

**Influences of weight and thickness on cooking time required for various mechanically tenderized beef steaks to reach minimum safe internal temperature without resting.**

J. Saha <sup>¶</sup>, D. Jaroni\*, J. Nelson, C. Willoughby, C. McDaniel <sup>¶</sup>, and R. Jadeja\*.  
LWT Food Science and Technology. Retrieved from <https://doi.org/10.1016/j.lwt.2018.04.069.rav>.

**Inulin fiber dose-dependently modulates energy balance, glucose tolerance, gut microbiota, hormones and diet preference in high-fat fed male rats.**

A. Singh, R.C. Zapata, A. Pezeshki\*, R.D. Reidelberger, and P.K. Chelikani.  
The Journal of Nutritional Biochemistry, 59, 142-152.

**Long-established and emerging pesticide poisoning in horses.**

A.L. Nagy, C. Cortinovis, L.J. Spicer\*, M.C. Perego <sup>¶</sup>, and F. Caloni.  
Equine Veterinary Education. doi:10.1111/eve.12887

**Medium-chain triglycerides attenuate liver injury in lipopolysaccharide-challenged pigs by inhibiting necroptotic and inflammatory signaling pathways.**

L. Zhang, X. Wang, S. Chen, S. Wang, Z. Tu, G. Zhang\*, H. Zhu, X. Li, J. Xiong, and Y. Liu.  
International Journal of Molecular Sciences, 19(11), 3697.

**MicroRNA 221 expression in theca and granulosa cells: hormonal regulation and function.**

C.L. Robinson, L. Zhang, L.F. Schütz, M.L. Totty, and L.J. Spicer\*.  
Journal of Animal Science, 96(2), 641-652.

**Mitochondrial degeneration depletion of NADH, and oxidative stress increase metmyoglobin formation in wet-aged beef longissimus muscle.**

R. Mitacek, J. Prenni, R. Jadeja, D.L. VanOverbeke\*, G.G. Mafi\*, and R. Ramanathan\*.  
Journal of Food Science, 84(1), 38-50.

**Modeling techniques for prediction of safe cooking times of mechanically tenderized beef steaks.**

J. Saha <sup>□</sup>, R. Jadeja\*, G.G. Mafi\*, J. Nelson, R. Ramanathan\*, and D. Jaroni\*.  
Meat and Muscle Biology, 2(1), 180-188.

**Modified atmosphere packaging improves surface color of dark-cutting beef.**

R.M. Mitacek, A.R. English, G.G. Mafi\*, D.L. VanOverbeke\*, and R. Ramanathan\*.  
Meat and Muscle Biology, 2(1), 57-63.

**Muscle-specific mitochondrial functionality and its influence on fresh beef color stability.**

R.A. Mancini, K. Belskie, S.P. Suman, and R. Ramanathan\*.  
Journal of Food Science, 83(8), 2077-2082.

**National Beef Quality – Audit 2016: Assessment of cattle hided characteristics, offal condemnations, and carcass traits to determine the quality status of the market cow and bull beef industry.**

M.K. Harris, L.C. Eastwood, C.A. Boykin, A.N. Arnold, K.B. Gehring, D.S. Hale, C.R. Kerth, D.B. Griffin, J.W. Savell, K.E. Belk, D.R. Woerner, J.D. Hasty, R.J. Delmore, J.N. Martin, T.E. Lawrence, T.J. McEvers, D.L. VanOverbeke\*, G.G. Mafi\*, M.M. Pfeiffer <sup>□</sup>, et al.  
Translational Animal Science, 2(1), 37-49.

**National Beef Quality Audit – 2016.**

D.L. VanOverbeke\* and J. Fulton.  
Journal of Animal Science, 96(2), 35-36.

**Novel nitrite-embedded packaging improves surface redness of dark-cutting longissimus steaks.**

R. Ramanathan\*, R.M. Mitacek, S.D. Billups <sup>□</sup>, R. Jadeja\*, M.M. Pfeiffer <sup>□</sup>, G.G. Mafi\*, and D.L. VanOverbeke\*.  
Translational Animal Science, 2(2), 135-143.

**Nutrient intake, rumen fermentation, and growth performance of dairy calves fed extruded full-fat soybean as a replacement for soybean meal.**

A. ZeidAli-Nejad, G.R. Ghorbani, S. Kargar, A. Sadeghi-Sefidmazgi, A. Pezeshki\*, and M.H. Ghaffari.  
Animal, 12(4), 733-740.

**Nutrients mediate intestinal bacteria – Mucosal immune crosstalk.**

N. Ma, P. Guo, J. Zhang, T. He, S.W. Kim, G. Zhang\*, and X. Ma.  
Frontiers in Immunology, 9, 5.

**Nutritional composition, gross energy concentration, and in vitro digestibility of dry matter in 46 sources of bakery meals.**

Y. Liu, R. Jha, H.H. Stein, S.D. Carter\*, et al.  
Journal of Animal Science, 96(11), 4685-4692.

**Optimal beef cow weights in the U.S. southern plains.**

C. Bir, E.A. DeVuyst, M. Rolf, and D. Lalman\*.  
Journal of Agricultural and Resource Economics, 43(1), 102-116.

**Pig social status and chronic cold or crowd stressors differentially impacted immune response.**

J.L. Salak-Johnson\* and S.R. Webb.  
Open Journal of Animal Science, 8, 280-93.

**Post-AI supplementation with ca salts of soybean oil increases pregnancy success in bos taurus beef cows.**

A.P. Brandao, R. Cooke, K.M. Schubach, R. Marques, K.G. Pohler, R. Carvalho, et al.  
Journal of Animal Science, 96(1), 25.

**Preference evaluation of ground beef by untrained subjects with three levels of finely textured beef.**

S.M. Depue, M.M. Neilson, J.L. Lusk, G.G. Mafi\*, F.B. Norwood, R. Ramanathan\*, et al.  
PloS one, 13(1), e0190680.

**Presence of oxygen and mitochondria in skeletal muscle early postmortem.**

E.M. England, S.K. Matarneh, R.M. Mitacek, A. Abraham, R. Ramanathan\*, J.C. Wicks, H. Shi, T.L. Scheffler, E.M. Oliver, E.T. Helm, and D.E. Gerrard.  
Meat Science, 139, 97-106.

**Progesterone effects on extracellular vesicles in the sheep uterus.**

G.W. Burns, K.E. Brooks, E.V. O'Neil, D.E. Hagen\*, S.K. Behura, and T.E. Spencer.  
Biology of Reproduction, 98(5), 612-622.

**Punica granatum rind extract promotes mouse liver mitochondrial function and attenuates paraquat toxicity in a caenorhabditis elegans model.**

C. Mowery, R. Ramanathan\*, and A. Johny.  
FASEB JOURNAL, 32(1), 9650.

**Resistance of various shiga-toxin producing escherichia coli strains and serogroups to infra-red and pulsed UV radiation and effect of nalidixic acid adaptation.**

S. Chintagari, R. Jadeja\*, and Y. Hung.  
LWT Food Science and Technology, 102, P356-363.

**Response to questions posed by the Department of Defense regarding microbiological criteria as indicators of process control or insanitary conditions.**

National Advisory Committee on Microbiological Criteria for Foods (P. Muriana co-author).  
Journal of Food Protection, 81(1), 115-141.

**Role of mitochondria in beef color: A review.**

R. Ramanathan\* and R.A. Mancini.  
Meat and Muscle Biology, 2(1), 309-320.

**Sensory evaluation of ground beef with varying levels of finely textured beef.**

S.M. Depue, M.M. Neilson, J.L. Lusk, G.G. Mafi\*, R. Ramanathan\*, D.L. VanOverbeke\*, and B. Norwood.  
PLoS ONE, 13(1), e0190680.

**Short and long-term effects of weaning age on pig innate immune status.**

J.L. Salak-Johnson\* and S.R. Webb.  
Journal of Animal Science, 8, 137-150.

**Soil pH is the primary factor correlating with soil microbiome in karst rocky desertification regions in the Wushan County, Chongqing, China.**

D. Qi, X. Wieneke, J. Tao, X. Zhou, and U. Desilva\*.  
Frontiers in Microbiology. doi: 10.3389/fmicb.2018.01027

**Stewardship of energy use by beef cows: Maintenance requirements of the U.S. cowherd.**

D. Lalman\* and C. Andresen<sup>¶</sup>.  
Journal of Animal Science, 96(3), 96.

**Supplementing energy in conjunction with monensin improves sustainability of stocker cattle grazing winter wheat.**

L.R. Thompson, M.R. Beck, G.D. Williams, S.E. Place, and R. Reuter\*.  
Journal of Animal Science, 96(1), 37.

**Test duration for water intake, average daily gain, and dry matter intake in beef cattle.**

C.M. Ahlberg, K. Allwardt, S. Broocks, K. Bruno<sup>¶</sup>, L. McPhillips, A. Taylor, C.R. Krehbiel, M. Calvo-Lorenzo, C.J. Richards\*, S.E. Place, U. DeSilva\*, D.L. VanOverbeke\*, et al.  
Journal of Animal Science, 96(8), 3043-54.

**The effects of Capn1 gene inactivation on the differential expression of genes in skeletal muscle.**

W.T. Oliver, B.N. Keel, A.K. Lindholm-Perry, J. Horodyska, and A.P. Foote\*.  
Gene, 668, 54-58.

**The effects of protein supplementation of fall calving beef cows on pre-and postpartum plasma insulin, glucose and IGF-I, and postnatal growth and plasma insulin and IGF-I of calves.**

K.J. McLean, B.H. Boehmer, L.J. Spicer\*, and R.P. Wettemann\*.  
Journal of Animal Science, 96, 2629-2639.

**The relationship between blood metabolites and hormones with intake, gain, and efficiency in beef Cattle consuming forage then concentrate diets.**

M.S. Grant and A.P. Foote\*.  
Journal of Animal Science, 96, 252.

**The role of tight junction proteins in ovarian follicular development and ovarian cancer.**

L. Zhang, T. Feng, and L.J. Spicer\*.  
Reproduction, 155, R183-R198.

**Transcriptome profiling of bovine ovarian theca cells treated with fibroblast growth factor 9.**

L.F. Schütz, R.E. Hurst, N.B. Schreiber, and L.J. Spicer\*.  
Domestic Animal Endocrinology, 63, 48-58.

**Tryptophan restriction partially recapitulates the age-dependent effects of total amino acid restriction on energy balance in diet-induced obese rats.**

R.C. Zapata, A. Singh, A. Pezeshki\*, and P.K. Chelikani.  
The Journal of Nutritional Biochemistry, 65, 115-127.

**Variability in supplement intake affects performance of beef steers grazing dormant tallgrass prairie.**

G.D. Williams, M.R. Beck, L.R. Thompson, G.W. Horn\*, and R.R. Reuter\*.  
The Professional Animal Scientist, 34(4), 364-371.

**Weather tools for retrospective assessment of restoration outcomes.**

C.A. Moffet, S.P. Hardegree, J.T. Abatzoglou, K.C. Hegewisch, R.R. Reuter\*, et al.  
Rangeland Ecology & Management, 72(2), 225-229.

**Whole cottonseed supplementation improves performance and reduces methane emission intensity of grazing beef steers.**

M.R. Beck, L.R. Thompson, J.E. White, G.D. Williams, S.E. Place, C.A. Moffet, S.A. Gunter, and R.R. Reuter\*.  
The Professional Animal Scientist, 34(4), 339-345.

**Yogurt fortification with chickpea (cicer arietinum) flour: Physicochemical and sensory effects.**

X. Chen, M. Singh, K. Bhargava, and R. Ramanathan\*.  
Journal of the American Oil Chemists' Society, 95(8), 1041-1048.

# 2018 Presentations

## *Faculty Invited Presentations*

Ravi Jadeja\*. "Are You Ready for FSMA and Third Party Audits?" Horticulture Industry Show, Tulsa, Oklahoma, Jan. 5, 2018.

Ravi Jadeja\*. "GFSI Benchmarked Audits for Small Meat Processors." Innovations in Livestock Sector for Doubling Farmers Income: Strategies and Opportunities in Meat Value Chain, India (online presentation), July 27, 2018.

Ravi Jadeja\*. "3rd Party Auditing: An Emerging Trend in the Food Industry." Oklahoma Association of Environmental Health Professional Annual meeting, Oklahoma State University, Broken Arrows, Oklahoma, Sep. 7, 2018.

Ravi Jadeja\*. "Introduction to Food Safety Modernization Act." Oklahoma Association of Environmental Health Professional Annual meeting, Oklahoma State University, Broken Arrows, Oklahoma, Sep. 7, 2018.

Ravi Jadeja\*. "The U.S. Food Industry and FDA." US-Kagoshima-Asia Triad Program in a Multipolar World Conference, Kagoshima, Japan (online presentation), Dec. 5, 2018.

David Lalman\*. "Changes in the U.S. Cowherd and Their Implication on Heifer Development." ASAS Southern Section, Ft. Worth, Texas, Feb. 2-6, 2018.

David Lalman\*. "Matching Beef Cows to Forage Resources." Hemphill County Texas A&M AgriLife Beef Cattle Conference, Canadian, Texas, April 19, 2018.

David Lalman\*. Implications of Cow Size Change. 2018 Florida Beef Cattle Short Course, Gainesville, Florida, May 9-11, 2018.

David Lalman\*. "Maintenance Requirements in Cows." ASAS, Vancouver, Canada, July 8-12, 2018.

David Lalman\*. "California Net Energy System-Cows." California Net Energy System Symposium, Davis, California, Sep. 12-14, 2018.

David Lalman\*. "Fine-Tuning an Efficient Cowherd." High Plains Nutrition & Management Roundtable, Laramie, Wyoming, Oct. 4, 2018.

Ranjith Ramanathan\*. "Alternate meat protein sources." Innovate, American Society of Animal Science, Atlanta, Georgia, September 10, 2018.

Ranjith Ramanathan\*. "Recent updates in meat quality research." College of Veterinary and Animal Sciences, Kerala, India, Dec. 21, 2018.

Ranjith Ramanathan\*, Rachel Mitacek <sup>g</sup>, Gretchen Mafi\*, and Deb VanOverbeke\*. "Biochemistry of dark-cutting beef." Meat and Muscle Biology concurrent session at the American Meat Science Association Reciprocal Meat Conference, Kansas City, Missouri, June 24-27, 2018.

Ranjith Ramanathan\*, Rachel Mitacek <sup>g</sup>, Anupam Abraham <sup>g</sup>, Gretchen Mafi\*, and Deb VanOverbeke\*. "Application of metabolomics to improve beef color." The Institute of Food Technologists Annual Meeting, Chicago, Illinois, July 19-22, 2018.

Ranjith Ramanathan\*, Deb VanOverbeke\*, Dan Stein\*, and Navam Hettiarachchy <sup>g</sup>. "Use of 3D Simulation Models to Enhance Student Learning in a Food Science Class." North American Colleges and Teachers of Agriculture (NACTA) Annual Conference, Iowa State University, Ames, Iowa, June 13, 2018.

Ranjith Ramanathan\*, Gretchen Mafi\*, and Deb VanOverbeke\*. "Meat Processing, Packaging, and Retailing in the USA: Industry Perspectives, Innovations, and Major Challenges." Indian Council of Agricultural Research-National Research Centre on Meat, Hyderabad, India, July 25, 2018.

Janeen Salek-Johnson\*. "Science of animal well-being should be at the forefront of cattle welfare issues." OSU/OVMA Summer Seminar, Center for Veterinary Health Sciences, Oklahoma State Veterinary School, Stillwater, Oklahoma, June 18, 2018.

Janeen Salek-Johnson\*. "Improving Pig Well-being Using Science." Oklahoma Pork Congress, Embassy Suites Hotel, Norman, Oklahoma, June 29, 2018.

Janeen Salek-Johnson\*. "Update on Swine and Cattle Welfare Issues." Advancing Animal Welfare Consortium (online meeting), Aug. 16, 2018.

Janeen Salek-Johnson\*. "Animal Health and Well-being: Where do we go from here?" OSU Beef Industry Conference, ConocoPhillips Alumni Center, Stillwater, Oklahoma, Oct. 19, 2018.

Janeen Salek-Johnson\*. "Scientific Research in Animal Well-being Essential to Advancing and Reacting to Industry and Consumer Needs," Sustainable Agriculture Summit Meeting in Advancing Animal Welfare Breakout Session, Hyatt Convention Center, Denver, Colorado, Nov. 15, 2018.

Janeen Salek-Johnson\*. "Animal Care and Well-being: Essential to Beef Industry." Oklahoma Beef Board, OK Farm Bureau, Oklahoma City, Oklahoma, Dec. 14, 2018.

Leon Spicer\*. "Identification of novel genes and their role in ovarian follicular growth and cyst formation in cattle." Università degli Studi di Napoli Federico II, Naples, Italy, March 22, 2018.

Leon Spicer\*. "Endocrine disruptor-contaminants and effects on the endocrine and reproductive system of domestic species." Università degli Studi di Milano, Milan, Italy, May 17, 2018.

Deb VanOverbeke\*. "Beef quality audit." National Cattlemen's Beef Association, 2018.

Glenn Zhang\*. "Mechanisms of synergistic regulation of intestinal host defense peptides and mucosa development by forskolin and Clostridium butyricum." National Science Foundation of China, Beijing, China, May 12, 2018.

Glenn Zhang<sup>g</sup>. "Development of next-generation natural alternatives to antibiotics." Eastman Chemical Company, Kingsport, Tennessee, Sep. 13, 2018.

### *Graduate Student Presentations*

Manish Aryal<sup>g</sup>. "Microplate Lethality Assay to Determine the Efficacy of Commercial Sanitizers for Inactivation of *Listeria Monocytogenes*, *E. coli* O157:H7, and *Salmonella* Sp. in Extended Biofilms." International Association for Food Protection, Salt Lake City, Utah, July 9, 2018.

Abigail Bechtold, Gretchen Mafi\*, Deb VanOverbeke\*, and Ranjith Ramanathan\*. "Comparison of myoglobin, hemoglobin, and cytochrome c oxidation properties." American Meat Science Association Annual Reciprocal Meat Conference, Kansas City, Missouri, June 24-27, 2018.

Kassidy Bliss, Kelsey Bruno<sup>g</sup>, and Chris Richards\*. "Varying Hematocrit levels in water restricted beef cattle." Oklahoma State University Undergraduate Research Symposium, Stillwater, Oklahoma, April 20, 2018.

Audrey Boeken<sup>g</sup>. "Use of Green-Label Bacteriocin-Containing Microbial Fermentates for Control of *Listeria Monocytogenes* in RTE Meat Applications." International Association for Food Protection, Salt Lake City, Utah, July 11, 2018.

Kelsey Bruno<sup>g</sup>, Elizabeth DeSocio<sup>g</sup>, Jason White, and Blake Wilson\*. "Effect of environmental enrichment devices on behavior of individually housed beef heifers." American Soc. Anim. Sci: National Meetings, Vancouver, Canada, July 10, 2018.

Kelsey Bruno<sup>g</sup>, Levi McPhillips, Michelle Calvo-Lorenzo, Clint Krehbiel, Udaya DeSilva\*, Sara Place, Deb Vanoverbeke\*, Megan Rolf, and Chris Richards\*. Effect of Temperament Measures on Feedlot Cattle Performance. American Soc. Anim. Sci.: Southern Section, Fort Worth, Texas. Feb. 5, 2018.

Andrew Cassens, Kendra Wills<sup>g</sup>, Morgan Pfeiffer<sup>g</sup>, Gretchen Mafi\*, Deb VanOverbeke\*, and Ranjith Ramanathan\*. "Effects of antioxidant/beef flavor-enhancement and modified atmosphere packaging of dark-cutting beef on retail display, flavor, and tenderness." American Meat Science Association Annual Reciprocal Meat Conference, Kansas City, Missouri, June 24-27, 2018.

Anna Goldkamp<sup>g</sup>. "de novo Transcriptomes of the Burying Beetles *Nicrophorus pustulatus* and *Nicrophorus orbicollis*." Arthropod Genomics Symposium, Urbana-Champaign, Illinois, June 8, 2018.

Anna Goldkamp<sup>g</sup>. "Differentially expressed tRNA fragments in bovine fetuses with assisted reproduction induced congenital overgrowth syndrome." Annual Research Symposium in Biological Sciences, Stillwater, Oklahoma, Sep. 21, 2018.

Taylor Husz<sup>g</sup>. "Effects of Ractopamine Hydrochloride on Slice Shear Slice Force within USDA Quality Grade of Feedlot Holstein Steers." ASAS Midwest Section, Omaha, Nebraska, March 13, 2018.

Taylor Husz<sup>g</sup>. "Effects of Ractopamine Hydrochloride on Slice Shear Slice Force within USDA Quality Grade of Feedlot Holstein Steers." Plains Nutrition Council, San Antonio, Texas, April 6, 2018.

Taylor Husz<sup>g</sup>. "The effect of competition for an automated supplement feeder on supplement intake behavior of beef stocker steers." ASAS - Southern Section, Oklahoma City, Oklahoma, Jan. 29, 2019.

Frank Kiyimba<sup>g</sup>, Mahesh Nair, Gretchen Mafi\*, Deb VanOverbeke\*, and Ranjith Ramanathan\*. "Effect of high oxygen partial pressure on 4-hydroxy-2-nonenal induced myoglobin oxidation, oxidation-reduction potential, and myoglobin unfolding." American Meat Science Association Annual Reciprocal Meat Conference, Kansas City, Missouri, June 24-27, 2018.

Wentao Lyu<sup>g</sup>, Judy Deng<sup>g</sup>, Lakshmi Sunkara, Sage Becker<sup>u</sup>, Kelsy Robinson<sup>g</sup>, Robert Matts, and Glenn Zhang\*. "High throughput screening for natural host defense peptide-inducing compounds as novel alternatives to antibiotics." Poultry Science Association Annual Meeting, San Antonio, Texas, July 23-26, 2018.

Conner McDaniel<sup>g</sup>, Sabra Billups<sup>g</sup>, Tony Kountoupis<sup>g</sup>, Divya Jaroni\*, and Ravi Jadeja\*. "Efficacy of novel antimicrobial sodium acid sulfate used in fresh cut produce." Oklahoma Research Symposium, Oklahoma State University, Stillwater, Oklahoma, 2018.

Conner McDaniel<sup>g</sup>, Sabra Billups<sup>g</sup>, Tony Kountoupis<sup>g</sup>, Divya Jaroni\*, and Ravi Jadeja\*. "Evaluating antimicrobial efficacy of sodium acid sulfate to reduce *E. coli* O157:H7 from chopped bell peppers." Whiteman Research Competition, Department of Animal Science, Oklahoma State University, Stillwater, Oklahoma, 2018.

Conner McDaniel<sup>g</sup> and Ravi Jadeja\*. "Novel Antimicrobial to Increase Produce Safety." College Level 3 Minute Thesis Competition, Oklahoma State University, Stillwater, Oklahoma, Nov. 6, 2018.

Conner McDaniel<sup>g</sup>, Sabra Billups<sup>g</sup>, Tony Kountoupis<sup>g</sup>, Divya Jaroni\*, and Ravi Jadeja\*. "Evaluating the Effectiveness of Sodium Acid Sulfate to Reduce *E. coli* O157:H7 and *S. Typhimurium* DT104 from Chopped Bell Peppers." International Association for Food Protection, Salt Lake City, Utah, July 8-11, 2018.

Adam McGee<sup>g</sup>, J.R. Cole, Corbit Bayliff, Miles Redden, C.M. Spencer, Axel Wiseman<sup>g</sup>, J.G. Warren, Ryan Reuter\*, D. Doye, Gerald Horn\*, and David Lalman\*. "Evaluation of Net Returns to Risk and Management in an Intensified Cow-Calf Production System." American Society of Animal Science, Fort Worth, Texas, Feb. 3-6, 2018.

Rachel Mitacek, Ravi Jadeja\*, Deb VanOverbeke\*, Gretchen Mafi\*, and Ranjith Ramanathan\*. "The effects of postmortem aging on beef color stability and biochemical properties." Institute of Food Technologists Annual Meeting, Chicago, Illinois, July 19-22, 2018.

Collin Mowery, Ranjith Ramanathan\*, and Aneesh Johny. "Punica granatum extract promotes mitochondrial function and attenuates paraquat toxicity." Experimental Biology Conference, Programming Society: American Society for Biochemistry and Molecular Biology, San Diego, California, April 22-26, 2018.

Taylor Neilson, Morgan Pfeiffer <sup>g</sup>, Gretchen Mafi\*, Deb VanOverbeke\*, and Ranjith Ramanathan\*. "Pomegranate rind extract limits ground beef color discoloration and lipid oxidation." American Meat Science Association Annual Reciprocal Meat Conference, Kansas City, Missouri, June 24-27, 2018.

Maria Perego <sup>g</sup>, Breanne Morrell, Luis Schutz, and Leon Spicer\*. "Endogenous production of UHRF1 and effects of E2F transcription factors and FGF9 on UHRF1 mRNA abundance in ovarian cells." Annual Cancer Research Symposium, Stephenson Cancer Center, University of Oklahoma College of Medicine, Oklahoma City, Oklahoma, Feb. 2, 2018.

Morgan Pfeiffer <sup>g</sup>, Gretchen Mafi\*, Taylor Neilson, Ranjith Ramanathan\*, and Deb. VanOverbeke\*. "Frequencies and severity of injection-site lesions in muscles from rounds of cow carcasses." American Meat Science Association Annual Reciprocal Meat Conference, Kansas City, Missouri, June 24-27, 2018.

Dennis Pletcher <sup>g</sup>. "Use of Listeria Innocua and Clostridium Sporogenes as Surrogate Organisms for in-Plant Validation of a Sous Vide Process for Chicken Breasts Using Celery Nitrite." International Association for Food Protection, Salt Lake City, Utah, July 9, 2018.

Kelsy Robinson <sup>g</sup>, Yingping Xiao, Jiangchao Zhao, Hua Yang, and Glenn Zhang. "Association of the jejunal microbiome and transcriptome with growth in broiler chickens." Poultry Science Association Annual Meeting, San Antonio, Texas, July 23-26, 2018.

Joyjit Saha <sup>g</sup> and Divya Jaroni\*. "Commercialization potential of STEAK (Safe Temperature Estimator At a Klick) Software." National Science Foundation I-Corps Summer Cohort 2018 Program, Spears School of Business - Oklahoma State University, Stillwater, OK, July 31, 2018.

Joyjit Saha <sup>g</sup>, Ravi Jadeja\* and Divya Jaroni\*. "STEAK-Safe Temperature Estimator at A Klick: A simple, spreadsheet-based tool to create safe cooking time-labels for mechanically tenderized beef steaks." International Association for Food Protection, Salt Lake City, Utah, July 9, 2018.

Joyjit Saha <sup>g</sup>, Ravi Jadeja\*, and Divya Jaroni\*. "Efficacy of bacteriophages as beef trim intervention treatment against Shigatoxigenic Escherichia coli." International Association for Food Protection, Salt Lake City, Utah, July 9, 2018.

Joyjit Saha <sup>g</sup>, Ravi Jadeja\*, and Divya Jaroni\*. "Quantitative Microbial Risk Assessment approach for selecting pathogen control strategies during ground beef processing." International Association for Food Protection, Salt Lake City, Utah, July 9, 2018.

Joyjit Saha <sup>g</sup>, Ravi Jadeja\*, and Divya Jaroni\*. "Quantitative Microbial Risk Assessment for the selection of pathogen control strategies during ground beef processing: A cost effective approach." American Meat Science Association Annual Reciprocal Meat Conference, Kansas City, Missouri, June 24-27, 2018.

Joyjit Saha <sup>g</sup>, Ravi Jadeja\*, and Divya Jaroni\*. "Quantitative Microbial Risk Assessment: A cost-effective tool for deciding on pathogen control strategies during ground beef processing." FAPC Research Symposium 2018, OSU, Stillwater, Oklahoma. Feb. 26, 2018.

Joyjit Saha <sup>g</sup>, Ravi Jadeja\*, Jacob Nelson, and Divya Jaroni\*. "A simple spreadsheet-based tool, utilizing predictive modeling, to generate safe-cooking time labels for mechanically tenderized beef steaks." Whiteman Research Competition 2018, AFS, OSU, Stillwater, Oklahoma, Feb. 15, 2018.

Shelby Spring, Cedrick Shili <sup>g</sup>, and Adel Pezeshki\*. "Effect of low protein diets with or without supplemented synthetic amino acids on growth performance of nursery pigs." Midwest section of American Society of Animal Science (ASAS), Omaha, Nebraska, March 12-14, 2018.

Nicole Stevenson <sup>u</sup>, Kelsey Bruno <sup>g</sup>, and Chris Richards\*. "Effects of water restriction on shade seeking behavior in beef cattle." Oklahoma State University Undergraduate Research Symposium, Stillwater, Oklahoma, April 20, 2018.

Sydney Stewart <sup>g</sup>. "If You Give a Pig a Penicillin: Livestock Health, Performance, and Welfare in the 'Post-Antibiotic' Age." 64th Annual Fulbright Mid-Year Seminar, Berlin, Germany, March 19, 2018.

Alex Taylor, Kelsey Bruno, Michelle Calvo-Lorenzo, Clint Krehbiel, Udaya DeSilva\*, Sara Place, Deb Vanoverbeke\*, Megan Rolf, and Chris Richards\*. "The Effects of Extended Water Restriction on the Hematological Cell Distribution of Beef Cattle in Confinement." American Soc. Anim. Sci.: Midwest Section, Omaha, Nebraska, March 14, 2018.

Parker Wilson, Collin Mowery, and Ranjith Ramanathan\*. "Binding of 4-hydroxy-2-nonenal decrease non-enzymatic methemoglobin reducing capacity." Experimental Biology Conference, San Diego, Programming Society: American Society for Biochemistry and Molecular Biology, April 22-26, 2018.

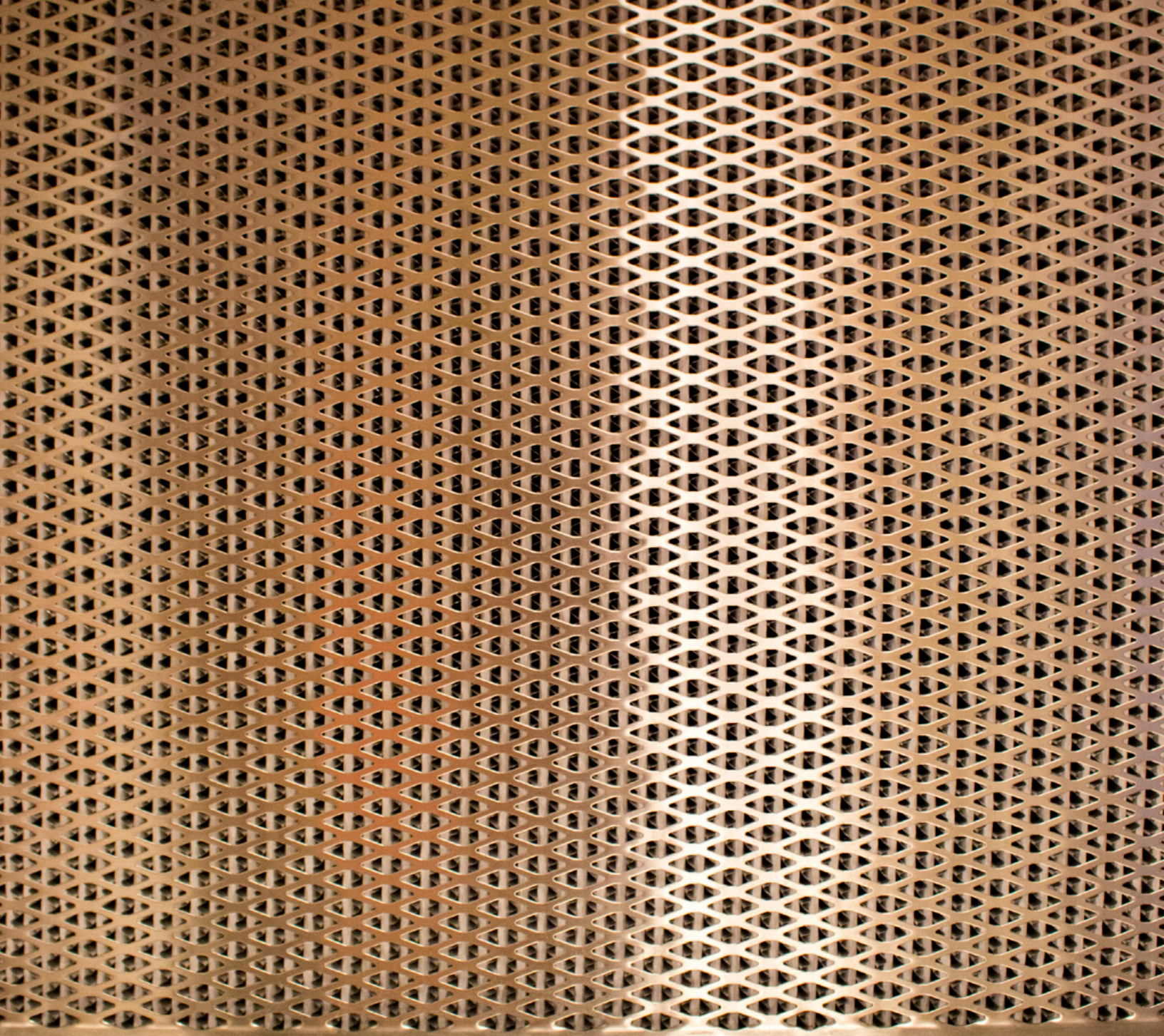
Axel Wiseman <sup>g</sup>, Miles Redden, Courtney Spencer, Adam McGee <sup>g</sup>, Ryan Reuter\*, and David Lalman\*. "Effects of timing of weaning on calf performance and maintenance energy requirements in primiparous beef cows." American Society of Animal Science, Fort Worth, Texas, Feb. 3-6, 2018.

Qing Yang <sup>g</sup>, Binlong Chen, Kelsy Robinson <sup>g</sup>, and Glenn Zhang\*. 2018. "Forskolin and butyrate act synergistically in protecting chickens from necrotic enteritis." Poultry Science Association Annual Meeting, San Antonio, Texas, July 23-26, 2018.

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