

COWPOKE NEWS

Department of Animal Science, Oklahoma State University
Research Edition 2018

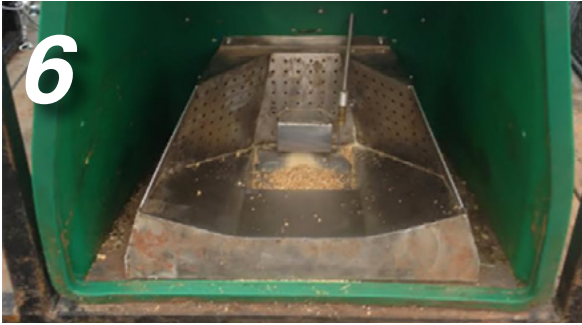




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On the Cover

Glenn Zhang is on the cover of this edition. Zhang serves as research coordinator and research committee chair in our department. Learn more about him on page 8.



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From the Research Coordinator

Dear Alumni and Friends:

It is with great excitement that we present you with the 2018 Research Edition of Cowpoke News! In this edition, you will find what we have accomplished in research in 2017. Our department boasts over a dozen faculty doing high impact research in various disciplines of animal and food sciences. We are also excited about the addition of two new faculty, Dr. Darren Hagen, an animal geneticist and Dr. Janeen Johnson, a stress physiologist. This edition features Dr. Peter Muriana's research on reducing *Listeria* contamination on onions (p. 4), Dr. Ryan Reuter's effort on quantifying methane emissions from stocker cattle grazing winter wheat (p. 6), and Dr. Leon Spicer's long-term collaboration with an Italian group on evaluating the impact of environmental toxins on livestock reproductive function (p. 10). My past 16 years of research on modulation of animal immunity and development of novel antibiotic alternatives is also spotlighted (p. 8). This edition reports a long list of research grants that our faculty obtained from various federal and state funding agencies and commodity groups (p. 12). Nearly 50 papers were published in top-tier journals by our faculty in 2017 alone (p. 14). Their national and international reputation is also attested by invited presentations they gave throughout the U.S. and world, as well as many prominent research awards they received.

Our departmental research has been further bolstered by a large number of outstanding graduate and undergraduate students as well as visiting scholars. Because of their research accomplishments, many of them were recognized with prestigious awards at national, regional, and university levels (p. 18). In 2017, 18 students graduated from our department with a Ph.D. or M.S. degree and are destined to become future academic and industrial leaders of animal and food sciences. Each year, we provide hands-on research experience to 20-25 promising students through our departmental undergraduate research scholar program. Many have gone on receiving research scholarships and awards from OSU and professional societies. We are proud to feature two such undergraduate scholars, Ms. Sage Becker and Ms. Jessie Payne in this issue.

In closing, we had another successful year in research and hope you will enjoy reading the stories and share our excitement. We are grateful to our alumni, donors, and sponsors for your steadfast support on our research endeavors. We look forward to your continued partnership. Last but not least, this issue would not be put together without the sustained effort of its editor, Mrs. Rebekah Alford. We are fortunate to have her expertise and always indebted to her persistence and creativity.

Best Wishes,
Glenn Zhang

Cowpoke News

Cowpoke News is published three times a year by the Department of Animal Science within the Division of Agricultural Sciences and Natural Resources (DASNR) at Oklahoma State University. 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 on the Department of Animal Science website at <http://www.ansi.okstate.edu/about/publications>. To subscribe, e-mail us at cowpokeneews@okstate.edu or mail in your request to Rebekah Alford. Please give us your full name and either your e-mail or mailing address.

About our Research

The Oklahoma State University Department of Animal Science 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, and sustainability. Our faculty and students conduct various research projects throughout the year in the pursuit of new discoveries. Each year, our researchers have had their work published in various scientific journals and have been recognized for their outstanding achievements. We also encourage undergraduate students to gain research experience and knowledge through our Undergraduate Research Scholar Program. Learn more about us on our website at <http://www.ansi.okstate.edu/research/>

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Fighting *Listeria* One Layer at a Time

Written by Rebekah Alford

Things are starting to heat up around here, literally! Peter Muriana, Oklahoma State University Department of Animal Science professor and Robert M. Kerr Food and Agricultural Products Center (FAPC) food microbiologist, has received a lot of recognition on one of his research projects, which involves discovering methods of eliminating the pathogenic bacteria *Listeria monocytogenes* on ready-to eat foods.

According to the Centers for Disease Control and Prevention (CDC), an estimated 1,600 people are infected with *Listeria monocytogenes* each year, and from those cases around 260 people will die. That means those that become infected have a 1 in 6 chance of it being fatal. Who is at risk? Anyone that consumes food contaminated with *Listeria* can become ill, but it affects pregnant women, newborns, the elderly, and people with poor immune systems the most.

Food contamination can originate from both the pre-harvest and post-harvest environment. Many gastrointestinal foodborne pathogens, like *Listeria*, can form strong layers of biofilm/microbiota on food processing equipment and externally grown produce. This biofilm protects the

harmful pathogen and prevents sanitizers from killing it.

“This is especially a problem with contaminated foods that are not subjected to a cook-kill step, such as those that are ready-to-eat,” said Muriana. “Onions are a commodity that can acquire *Listeria* contamination and because this product is often sliced/diced, there is the potential to transfer surface contamination on the intact onions to the cut surfaces of the pieces.”

Onions are often consumed raw since they are used as a condiment on many foods, such as hamburgers and sandwiches. When outbreaks occur involving these types of foods, every ingredient is labeled as a potential contributor for contamination until the true source is identified. Many recalls on processed onion products have occurred over the last decade, negatively affecting the supplier, distributor, and consumer.

Muriana turned to an industry partner, Unitherm Food Systems, in order to combat the issue. Unitherm has developed a patented gas-fired flame oven for pasteurizing the surface of onions. Because onions are multi-layered, with the outer layers constructed of thin-skin and the inner layers being thicker, the outer layers can be burned off during passage through a flame oven. Not only does this ‘flame-peeling’ remove the outer layers and leave the thicker, inner layers intact, but it pasteurizes the surface of the onion at the same time.

Because onions are multi-layered, the outer layers can be burned off easily during passage through a flame oven while leaving the inner layers intact.



“We performed an in-house validation using a non-pathogenic *Listeria* surrogate organism to inoculate onions to validate reduction of surface *Listeria*,” said Muriana. “We also evaluated the performance of the pasteurization on total bacterial levels and yeast and mold that would also contribute to spoilage and shorten shelf life of processed onions.”

By using this surface pasteurization method, processors can reduce risk of onions contributing to foodborne outbreaks. An added benefit of flame peeling technique is the reduction in waste and increase in useable product when compared to mechanical peelers.

In addition to surface pasteurization, Muriana is investigating other viable means to inhibit *Listeria* on ready-to-eat foods. Through this research, his team has developed a new method of killing *Listeria* using antimicrobial proteins produced by good bacteria.

Some types of bacteria produce proteins called bacteriocins that can kill other bacteria strains harmful to humans. In Muriana’s experiment, his research team combined multiple types of bacteriocins and applied the mixture to food infected with *Listeria*.

Eight of these bacteriocin mixtures have been licensed as antimicrobials for potential commercial use. Muriana’s team has also submitted data from the flame-peeling experiment to present at the National Meeting of the International Association for Food Protection and plans to submit the data for publication.

The lethal effects of gastrointestinal foodborne pathogens, like *Listeria monocytogenes*, is one of the many reasons why food safety is extremely significant. From farm to fork, manufacturer to store, restaurant to customer; it is important to adhere to safe food practices. Oklahoma State University research like Muriana’s is paving the way to a safer food supply.



(L to R): Chuck Willoughby, Manish Aryal, and Peter Muriana conducting *Listeria* research on onions.



Quantifying Enteric Methane Emissions from Stocker Cattle Grazing Winter Wheat

Written by Logan Thompson & Ryan Reuter

Enteric methane (CH₄) has received considerable attention from scientists and the public alike due to its contribution to the carbon footprint of the beef industry and its impact on the efficiency of the animal. These emissions can account for 2-12% of the animal's gross energy intake depending on the type of diet that is fed. Therefore, any management strategy that mitigates CH₄ production will be a win-win for producers. Not only would they be improving the environmental impact of the operation, but by increasing the efficiency of the animal they would increase the profitability of the operation. It is therefore beneficial to quantify emissions of different production systems to help gain insight into the efficiency of each system and determine appropriate mitigation options.

To that end, a significant economic contributor to Oklahoma beef production is winter wheat grazing. There are approximately 6-7 million head of stocker cattle on wheat every winter in Oklahoma. To date this system has garnered limited research quantifying the CH₄ emissions of cattle grazing winter wheat or the effects that supplementation has on those emissions. One common supplementation strategy for cattle grazing wheat pasture is an energy supplement called Oklahoma Greengold (GRG). This supplement consists primarily of ground corn or milo and contains monensin. Cattle on wheat can be energy deficient and supplementing energy has been shown to increase gains and profitability.

The objective of our research was to quantify CH₄ using a portable

GreenFeed system (GF; C-Lock Inc., Rapid City, SD) and calf performance at different levels of GRG supplementation. The GF is a new technology used for quantifying emissions from free grazing ruminant animals based on spot measurements. The system consists of a portable head-box system connected to an automatic feeder that dispenses a bait feed when an animal puts its head under the sensor (Figure 1). The bait feed is designed to have minimal impact on the animal's emissions and keep its head in the head-box for a minimum of three minutes to accurately estimate emissions.

Eight steers (BW= 261.85 ±32.9 kg) and eight heifers (BW= 239.97 ±21.02 kg) were selected from an original herd of 24 after adaptation to the GF in a dry lot, and placed into a 9.15 ha wheat pasture with the



Figure 1. A) The head-box where animals receive the bait feed and gas emissions are collected. B) Profile view of the GreenFeed.

GF. The cattle were then adapted to individual feeding stanchions. Calves were stratified by sex and randomly assigned to receive either 0, 0.21, 0.43, 0.64, 0.86, or 1.07 kg/d GRG. Two calves were assigned to the first five supplementation levels and six were assigned to the 1.07 kg/d treatment. Prior to starting the trial cattle were not fed in order to quantify a baseline CH₄ estimate for each animal. After the baseline period, calves were fed every Monday, Wednesday, and Friday and anyorts were weighed, so that actual intake was used in the analysis. Calves were weighed every Monday in order to determine animal performance.

Sex did not significantly impact animal performance or CH₄ and was removed from the analysis. Animal performance was not affected by supplement intake linearly or quadratically (P =0.12 and P =0.11, respectively), although there was a numerical increase with increased supplementation. Daily methane production (DMP) was not affected linearly or quadratically (P ≥0.33) but did have a significant linear

relationship with initial body weight (P =0.0038; R²=0.46). Emission intensity (g CH₄/kg gain; EI) was significantly impacted by supplement intake (P =0.0078; R² =0.53) indicating a minimum EI at approximately 0.53 kg/d GRG intake (Figure 2).

These results suggest that supplementing GRG to cattle grazing wheat pasture can reduce the EI of the wheat grazing stocker operations. Decreasing the emissions from the grazing sector of the beef industry is crucial to managing the footprint of the industry as these emissions represent the majority of the industry's CH₄ production. It is also crucial to understand that these emissions negatively impact the efficiency of the production system. Mitigating CH₄ has the potential to help the producers bottom line as dietary energy will be leaving the animal as a loss product. By providing an estimate of CH₄ of wheat grazing cattle we are also filling a gap in the literature so that this production system is accounted for in future estimates of the beef industry's environmental impact.

References:

- Johnson, K. A., and D. E. Johnson. 1995. Methane emissions from cattle. *J. Anim. Sci.* 73:2483–2492
- Horn, G. W. 2006. Growing cattle on winter wheat pasture: Management and herd health considerations. *Vet. Clin. Food Anim.* 22:335-356.
- Hill, J., C. McSweeney, A. G. Wright, G. Bishop-Hurley, K. Kalantar-zadeh. 2016. Review: Measuring Methane Production from Ruminants. *Trends in Biotechnology.* 34.1.
- Hogan, J. P. 1982. Digestion and utilization of protein. In: J. B. Hacker (Ed.). *Nutritional Limits of Animal Production from Pastures.* Commonwealth Agricultural Bureaux, Farnham Royal, UK. P. 245.
- Horn, G. W., and S. I. Paisley. 1999. Developments in the management and supplementation of stocker cattle on wheat pasture. Pages 48–54 in *Proc. 1999 Plains Nutr. Council. Spring Conf.*, San Antonio, TX. Texas A&M Res. Ext. Center, Amarillo.
- Hristov, A. N., J. Oh, F. Giallongo, T. Frederick, H. Weeks, P. R. Zimmerman, M. T. Harper, R. A. Hristova, R. S. Zimmerman, A. F. Branco. 2015. The Use of an Automated System (GreenFeed) to Monitor Enteric Methane and Carbon Dioxide Emissions from Ruminant Animals. *J. Vis. Exp.* 103.
- Velazco, J. I., D. G. Mayer, S. Zimmerman, and R. S. Hegarty. 2015. Use of short-term breath measures to estimate daily methane production by cattle. *The Anim. Consortium* pg. 1-9.
- Rotz C. A., B. J. Isenberg, K. R. Stackhouse-Lawson and E. J. Pollak. 2013. A simulation-based approach for evaluating and comparing the environmental footprints of beef production systems. *J. Anim. Sci.* 91: 5428-5437.

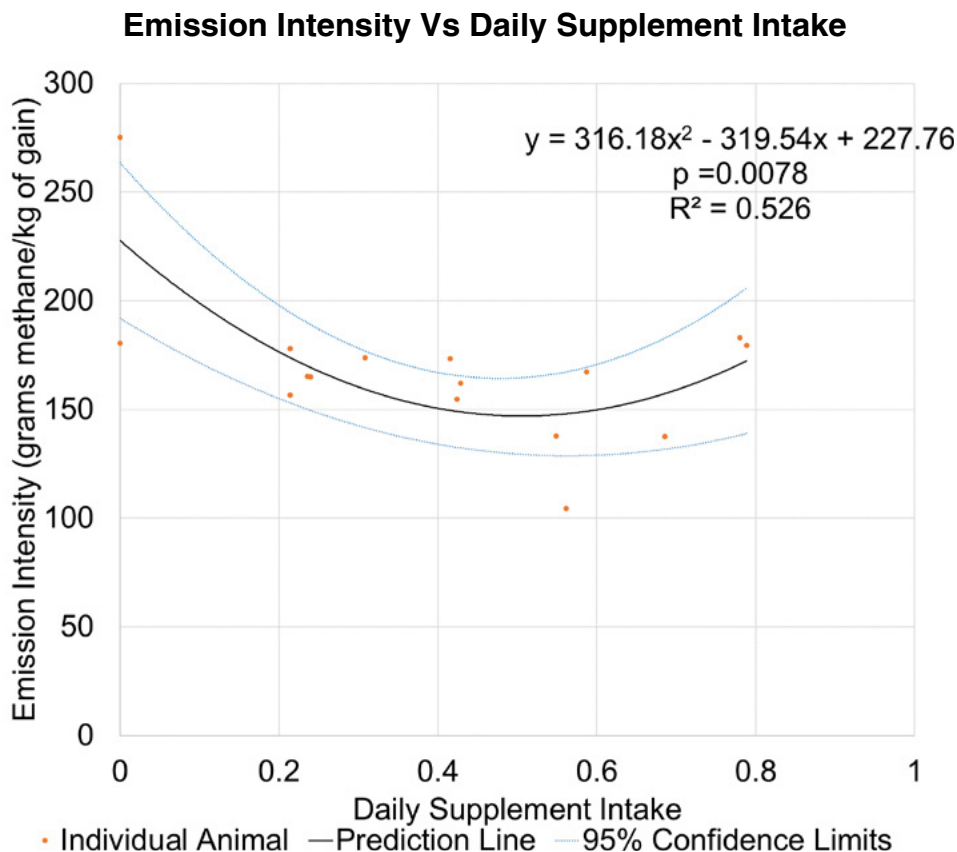


Figure 2. Emission intensity at differing levels of supplement intake.

Faculty Spotlight: Glenn Zhang

Written by Rebekah Alford

Glenn Zhang is currently a professor and Boulware Endowed Chair in the Department of Animal Science at OSU with an 80% research and 20% teaching appointment. He was trained as a molecular immunologist and has been working on the modulation of animal immunity and development of novel alternatives to antibiotics for livestock applications.

Zhang was originally from Anhui, China, where he grew up in countryside. From a young age, he became familiar with agriculture and livestock animals. He graduated with B.S. and M.S. degrees in animal science in 1993 and 1995, respectively, from China Agricultural University, a top agricultural institution in China.

He came to the U.S. in December 1995 and received his Ph.D. from College of Veterinary Medicine at Kansas State University in December 1999. After two years of postdoctoral training in the Howard Hughes Medical Institute and Department of Immunobiology at Yale University School of Medicine, he decided to seek an academic position back to the Midwest. He joined the Department of Animal Science at OSU as a tenure-track Assistant Professor in January 2002. He was tenured and promoted to associate professor in July 2007, promoted to full professor in July 2014, and further bestowed with a Ralph F. and Leila W. Boulware Chair in Animal Science in July 2016.

Zhang currently serves as research coordinator and research committee chair in our department, and serves on the Reappointment, Promotion and Tenure (RPT) Committee, Research Building Committee and Graduate Programs Committee.

"I became interested in research because of my senior project when

I was responsible for a chicken feeding trial," said Zhang. "I was excited about the novel findings of the trial and amazed to see the results being turned into a publication in a scientific journal. I witnessed potential transformative power of research and determined that research may be my way of making a difference to the livestock industry."

Since joining OSU, his research has been focused on the regulation of animal immunity with the long-term goal of developing effective strategies to achieve optimal animal health and performance without relying on antibiotics. Given rapid emergence of antibiotic resistance, a recent U.S. Food and Drug Administration (FDA) ban on most antibiotics for livestock production, and consumers' demand for antibiotic-free animal products, Zhang's research is filling the critical needs for innovative antibiotic alternatives for the livestock industry.

His research efforts have led to development of intellectual properties for OSU with strong potential for commercialization. For example, through systemic screening of the genomes of multiple animal species, his group has identified a number of small host defense peptides with direct antibacterial activities but a low risk of triggering resistance.

He has conducted a series of structure-activity relationship studies and revealed the potential of these small peptides and their analogs as novel antimicrobials against a wide range of agriculturally important pathogens, including drug-resistant strains. A U.S. patent on one of these peptides, named rattusin, was issued in April 2009.

Simultaneously, Zhang's team has developed a cell-based high-throughput screening assay



for discovery of small-molecule compounds with the ability to enhance endogenous host defense peptide synthesis, animal innate immunity, and disease resistance. As a result, a large group of natural and synthetic compounds have been identified with potential to be developed as cost-effective, antibiotic alternatives to disease control and prevention for livestock use. A utility patent, entitled "Immune Boosting Dietary Compounds for Disease Control and Prevention," was filed by OSU on March 8, 2017. A new start-up company, named "AltBiotics LLC", was founded by OSU in 2014 to exclusively develop and commercialize his innovations in alternatives to antibiotics. He is in the process of discussing with a U.S. feed additive company for the possibility of joint development of this technology.

In the past 16 years of his tenure at OSU, he has received over \$6.7 million in research funding as PI or co-PI, with five grants worth nearly \$1.7 million currently active from the USDA, OCAST, OSU, and Elanco Animal Health. To date, he has published 60 peer-reviewed papers in high-impact journals such as Science, Journal of Biological Chemistry, Frontiers in Immunology, Antimicrobial Agents and Chemotherapy, and Frontiers in Microbiology. His papers have an H index of 34, with a total of 6,230 citations and an average of over 100 citations per article (according to Google Scholar). He also wrote five book chapters and submitted 55 abstracts.

In recognition of his outstanding research achievements, Zhang received the Sigma Xi Young Investigator Award from OSU (2008), the Sigma Xi Chapter Lecturer Award from OSU (2015), the James A. Whatley Award for Meritorious Research from the Division of Agricultural Sciences and Natural Resources at OSU (2014), the Don M. Tyler Award from the OSU Department of Animal Science (2014), and an induction into the National Academy of Inventors (2012). Zhang was also a finalist for Regents Distinguished Research Award at OSU (2017) and inducted into the National Academy of Inventors in 2012 and Gamma Sigma Delta (Honor Society of Agriculture) in 2009, respectively.

His international influence and reputation was confirmed by a 2014 appointment as Chutian Endowed Visiting Professorship by Wuhan Polytechnic University in China. Zhang has also been invited to present 53 talks throughout the U.S., Europe, and China including keynote speeches at the 3rd Annual European Symposium on Host Defense Peptides in Utrecht, the Netherlands in 2010 and the 4th Annual Symposium on Gut Health in Production of Food Animals in Kansas City in 2015. He was also invited by USDA to speak on alternatives to antibiotics in Paris, France in 2012 and Ames, IA in 2016, respectively.

In addition to his outstanding research record, Zhang is an accomplished teacher, mentor, and advisor. He has been teaching both undergraduate- and graduate-level courses (ANSI 4843: Applications of Biotechnology in Animal Science and ANSI 5573: Techniques in Animal Molecular Biology) since 2002. He has also taught ANSI 3423: Animal Genetics twice in the past three years. He served as Major Professor for six M.S. and five Ph.D. students, who have successfully completed their degrees at OSU. Zhang is currently mentoring four Ph.D. students, one M.S. student, and five undergraduate research scholars in his lab. In addition, 12 postdoctoral fellows/visiting scholars, 19 undergraduate scholars, and four DVM students have benefited from research training in his lab.

“It is satisfying to witness professional growth of undergraduate and graduate students, and to make important discoveries with potential to change animal production practices,” said Zhang.

His students have consistently won research awards at the university and national levels. His undergraduate research scholars received six Wentz scholarships, four Niblack Scholarships, and one Fulbright Student Award to study in Germany (2017), while one was nominated by

OSU for the Goldwater Scholarship (2018). Some of the research awards to his graduate students include the highly competitive Predoctoral Fellowship from the USDA (2018), 1st Place in the 3-Minute Thesis (3MT) Finals at OSU (2014), 1st Place in poster competition from the American Association of Veterinary Immunologists (2003, 2005, and 2011), Graduate Student Research Paper Certificate of Excellence from the Poultry Science Association (2016, 2017), Graduate Research Excellence Award (2007) and Honorary Graduate Commencement Marshal (2014) from the OSU Graduate College.

Zhang is currently serving on the editorial board of three international journals and has served on grant review panels for all major U.S. funding agencies including the USDA, NIH, and NSF. Additionally, he served as chair of the Group I Graduate Faculty Association and President of the Asian American Faculty and Staff Association at OSU. He has been Treasurer of the American Association of Veterinary Immunologists since 2014.

Glenn has been married to his wife, Yan Song, for over 21 years. Together, they have three children; Alex (17 yr), Andrew (11 yr), and Audrey (8 yr). He enjoys Big 12 sports, fishing, playing tennis, ping-pong, basketball, and badminton in his spare time.



The Italian Connection

Department of Animal Science professor collaborates with University of Milan scientists over the last 13 years.

Leon Spicer, professor of reproductive physiology in the Department of Animal Science at Oklahoma State University (OSU), has been collaborating with Francesca Caloni, an expert in veterinary toxicology from the Department of Health, Animal Science and Food Safety in the Veterinary School at the University of Milan since 2004. This collaboration has led to six Italian visiting scholars coming to OSU to train in Spicer's research laboratory over the past 13 years. The research projects Spicer and his Italian visiting scholars have worked on vary widely in scope but have a common focus; namely, evaluating the impact of environmental toxins on farm animal reproductive function.

Their research efforts have resulted in 13 peer-reviewed publications and 30 abstracts presented at numerous international scientific meetings. Research of Caloni and Spicer has unequivocally implicated several *Fusarium* mycotoxins in reproductive disorders of swine and cattle. On a global scale, cereal grains and animal feed may be contaminated with trichothecenes, such as deoxynivalenol and T-2 toxin,

zearalenone, and fumonisins, the major mycotoxins of *Fusarium* fungi.

Spicer's experiments in vitro indicate that trichothecenes and fumonisins directly affect ovarian granulosa and theca cell function and thus have the potential to cause reproductive disorders in farm animals. Some of their work not associated with *Fusarium* fungi was the first to show that the algal toxin, domoic acid, has direct effects on ovarian granulosa and theca cell steroidogenesis, therefore suggesting that domoic acid has the potential to be an endocrine disruptor.

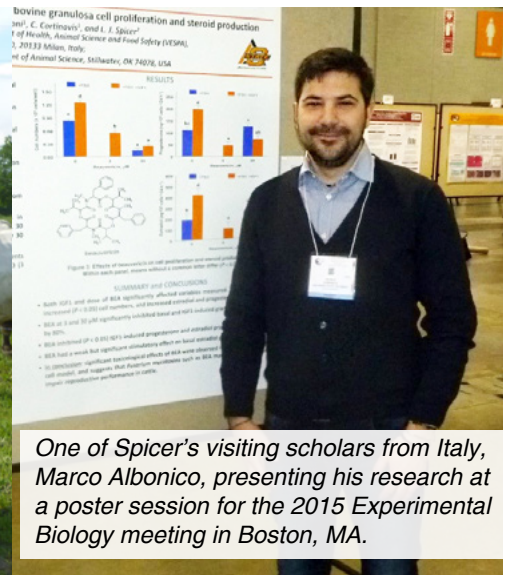
Spicer and Caloni have applied for several international grants (as co-principal investigators) and hope that their work will be funded in the near future. In recent years, Spicer's research laboratory has been funded by the National Institutes of Health, United States Department of Agriculture, and The Howard M. and Adene R. Harrington Chair in Animal Science. In total, Spicer has made 18 trips to Italy during the past 20 years. Some of the trips were for research collaboration but most were while leading his Italy study abroad class trips for students.

The main purpose of the study abroad trips is to expose students to sustainable agriculture methods used in Italy and to offer an opportunity to compare American and Italian agricultural systems. In addition, students were able to see the marvels of the Roman Empire, the artistic perfection of the Renaissance, enjoy exquisite Italian food, and learn more about the economic and political systems in modern Italy. During his trips to Italy, Spicer was able to establish three memoranda of understanding with OSU and the University of Milan, University of Padua, and the University of Bologna.

Clearly, Spicer's Italian connection has been beneficial to OSU and its students. He hopes that with these exchange scholars visiting Stillwater and the study abroad opportunities for OSU students in Italy, a first step to better communication and future collaboration will be made with one of our world partners. For more information, contact Spicer at leon.spicer@okstate.edu.



Spicer (right) with a group of study abroad students in Italy.



One of Spicer's visiting scholars from Italy, Marco Albonico, presenting his research at a poster session for the 2015 Experimental Biology meeting in Boston, MA.

Faculty Research

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.

Ravi Jadeja - Developing food safety strategies.

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

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 and hormonal 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 leptin, IGF-I and the IGF system 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.

New Faculty

We have two new members in our research faculty; Darren Hagen and Janeen Johnson.

Darren Hagen joined our department in July of 2017. He was previously a faculty member at the University of Missouri. His research focuses on 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.

Janeen Johnson joined our department in December of 2017. She was previously a faculty member at the University of Illinois. Her research goal is to increase scientific knowledge of 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.



Research Grants

Faculty members indicated by *

New Grants

*Ali Beker (PI) and *Adel Pezeshki (Co-PI). Herbanimals Supplements llc. Effects of herbanimal supplement as an alternative to antibiotic use in broiler chickens performance, carcass composition, and immune status. 8/1/2017 - 12/31/2018. \$23,000.

*Ali Beker (PI). Italian Contribution to the Education. Italian contribution to the education sector development programme - Post Grad Program. 1/1/2017 - 12/31/2019. \$159,727.

*Scott Carter (PI). Zinpro Corp. Determination of the efficacy of water soluble zinc on growth performance and immune response of nursery pigs. 7/1/2017 - 12/31/2017. \$28,532.

Sabit Ekin (PI), Jintong Hu (Co-PI), and *Ryan Reuter (Co-PI). OSU I-Corps Site Team. Low-maintenance livestock monitoring via environment-powered internet of things. 7/01/2017 - 6/31/2018. \$3,000.

Sandip Harimkar (PI), Hitesh Vora (Co-PI), *Ravi Jadeja (Co-PI), *Divya Jaroni (Co-PI), *Ranjith Ramanathan (Co-PI), et. al. Metal Additive Manufacturing Multi-User Core Facility. V.P Research Core Facility Support. 1/5/2017- 1/5/2018. \$336,000.

*Ravi Jadeja (PI). ODAFF. Whole-chain traceability to improve food safety: Melons. 1/9/2017 - 1/9/2019. \$21,076.

*Ravi Jadeja (PI) and *Divya Jaroni (Co-PI). TBDP/OSU. Antimicrobial Ice Based Meat Grinder Sanitation Process Optimization. 11/1/17-10/30/18. \$5,500.

*David Lalman (PI). U.S. Department of Agriculture. Back to Basics: Expanding best management practice adoption in small and mid-sized beef enterprises. 5/1/2017 - 4/30/2021. \$109,025.

*Gretchen Mafi (PI). National Cattlemen's Beef Association. Oklahoma State University - Meat Science Graduate Research Assistantship. 10/1/2017 - 9/30/2018. \$15,000.

*Adel Pezeshki (PI). Agrivida, Inc. Effect of graded level of Phytase on growth performance of nursery pigs fed with moderately low protein diets. 10/15/2017 - 4/15/2018. \$19,394.

*Adel Pezeshki (PI). NIFA. Improving the growth performance of nursery pigs with low protein diets supplemented with both crystalline and branched chain amino acids. 1/01/2018 - 12/31/2019. \$150,000.

*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). USDA/AFRI. Seahorse XFp Oxygen analyzer to enhance mitochondrial research capabilities in meat quality studies. 1/1/2018 - 1/1/2019. \$22,832.

*Ranjith Ramanathan (PI). Association of Public and Land-Grant Universities. Use of interactive simulation models to promote and enhance student engagement in a food science class. 4/4/2017 - 8/31/2018. \$2,200.

*Ryan Reuter (PI). Merial, LTD. Performance and profitability of long-acting Eprinomectin (Long Range) in stocker steers grazing wheat pasture. 5/1/2017 - 9/30/2019. \$168,009.

*Chris Richards (PI), *Ryan Reuter (Co-PI), and *Blake Wilson (Co-PI). Dupont/ Danisco Animal Health. Comparing enzyme efficiency on total tract starch digestibility. 11/1/2017 - 8/31/2018. \$54,800.

*Deb VanOverbeke (PI). National Cattlemen's Beef Association. Market cow injection. 3/1/2017 - 1/31/2018. \$50,000.

*Blake Wilson (PI) and Ryan Reuter (Co-PI). Renovation of Critical Research Facilities Program. Modernization of the Willard Sparks Beef Research Center & Wheat Pasture Barn processing facilities. 12/14/2017 - 12/31/2018. \$60,000.

*Blake Wilson (PI). Kemin Industries Inc. Assessment of CLOSTAT Bacillus subtilis PB6 active microbial on the clinical health, performance, and carcass characteristics of cattle during the receiving and finishing phases. 8/1/2017 - 12/31/2018. \$100,000.

*Glenn Zhang (PI) and *Adel Pezeshki (Co-I). Elanco Animal Health. Effect of heat stress on broiler chickens medicated with different concentrations of nicarbazin. 11/17/2017 - 5/16/2020. \$52,937.

*Glenn Zhang (PI). OCAST. Development of next generation antibiotic alternatives. 8/1/2017 - 7/31/2018. \$92,431.

Continuing Grants

*Scott Carter (PI). MicroNutrients USA, LLC. Determination of the bioavailability of trace mineral sources for nursery pigs. 5/1/2016 - 6/30/2018. \$38,341.

*Divya Jaroni (PI). TBDP. Phage-Technology to control bio-film-forming Shigatoxigenic Escherichia coli in the food industry. 4/15/2016 - 3/28/2018. \$20,000.

*David Lalman (PI). KSU (USDA Climate Change). Resilience and vulnerability of beef cattle production in the Southern Great Plains under changing climate, land use and, markets. 8/1/2014 - 7/31/2018. \$345,110.

Susie Marshall (PI) and *Ravi Jadeja (Co-PI). USDA-NIFA. Customized food-safety intervention strategies for hard-to-reach producers. 10/1/2016 - 8/31/2019. \$435,714.

*Ranjith Ramanathan (PI), Steve Hartson (Co-PI), *Gretchen Mafi (Co-PI), and *Deb VanOverbeke (Co-PI). U.S. Department of Agriculture. Characterizing the biochemical mechanisms governing color of dark cutting beef. 8/1/2016 - 7/31/2019. \$149,980.

*Ryan Reuter (PI). KSU (USDA Climate Change). Resilience and vulnerability of beef cattle production in the Southern Great Plains under changing climate, land use and markets. 8/1/2014 - 7/31/2018. \$134,939.48.

*Ryan Reuter (PI). USDA ARS. Sustaining beef production in the Southern Plains through managing greenhouse gas emissions by grazing cattle. 9/1/2015 - 7/31/2020. \$71,685.

*Ryan Reuter (PI). USDA ARS. Sustainable beef-forage systems for the Southern Plains. 8/1/2015 - 7/30/2020. \$150,000.

*Ryan Reuter (PI). Elanco Animal Health. Additivity of Elanco stocker technologies in stocker cattle grazing wheat pasture. 12/14/2010 - Completion. \$108,902.

*Ryan Reuter (PI). US Poultry. Effect of feather meal inclusion on supplement intake behavior and performance in stocker cattle. 11/1/2016 - 10/31/2018. \$61,755.

*Chris Richards (PI). TCFA. Use of systems research to improve beef cattle feed and water use efficiency. 9/1/2014 - 3/14/2018. \$3,360.

*Chris Richards (PI). USDA. Beef cattle selection and management for adaptation to drought. 5/1/2014 - 2/28/2019. \$326,906.

*Chris Richards (PI). Danisco Animal Health (DuPont). Investigating the impact of acidosis on rumen fermentation, fecal characteristics, and blood parameter. 9/1/2016 - 8/31/2018. \$176,448.

*Chris Richards (PI). USDA. Beef cattle selection and management for adaptation to drought. 5/1/2014 - 2/28/2019. \$673,094.

*Chris Richards (PI). Danisco Animal Health (DuPont). Determine the ruminal starch digestibility of corn in beef cattle, in situ. 9/1/2016 - 8/31/2018. \$28,855.

*Chris Richards (PI). NOVUS International, Inc. Evaluation of Mintrex Beef chelated trace minerals on clinical signs, immune response variables, and mineral balance in calves following natural exposure to bovine viral diarrhoea virus type 1b and subsequent Mannheimia haemolytica infection. 12/1/2012 - Completion. \$31,591.

*Deb VanOverbeke (PI). Multisorb Technologies, Inc. Multisorb. 3/1/2015 - 2/28/2020. \$389,435.

*Deb VanOverbeke (PI). USDA ARS El Reno. ARS Meat Quality. 9/1/2014 - 8/31/2019. \$45,000.

*Blake Wilson (PI). Alltech, Inc. Evaluation of Bioplex organic trace minerals on clinical signs, immune response variables, and mineral balance in calves following natural exposure to bovine viral diarrhoea type 1 and subsequent Mannheimia haemolytica infection. 11/1/2016 - 1/11/2018. \$66,099.96.

*Blake Wilson (PI). Langston University. Genomics of resilience in sheep to climatic stressors. 6/2/2014 - 8/31/2018. \$124,537.

*Glenn Zhang (PI). NIFA. National Needs Fellowship Program in application of genomic and computational biology to animal production. 2/1/2013 - 1/31/2018. \$238,500.

2017 Completed Grants

*Gerald Horn (PI). NOVUS International, Inc. Methionine Hydroxy Analogue for growth of wheat pasture stocker cattle. 12/15/2009 - 9/26/2017. \$7,200.

*Ravi Jadeja (PI). PeroxyChem, LLC. PAA laden ice in meat grinders for microbial control. 7/15/2016 - 12/31/2017. \$14,097.

*David Lalman (PI). Alltech, Inc. Effects of Optimase and Rumensin in beef cows. 1/1/2013 - 5/3/2017. \$68,791.

*Gretchen Mafi (PI). NCBA. Oklahoma State University - Meat Science Graduate Research Assistantship. 10/1/2016 - 10/20/2017. \$15,000.

*Ranjith Ramanathan (PI). USDA. Application of metabolomics to determine the interrelationship between postmortem metabolite profile and beef color. 1/1/2014 - 3/24/17. \$78,626.

*Ranjith Ramanathan (PI). OCAST. Enhancing the value of dark cutters by postharvest techniques. 8/1/2016 - 10/17/2017. \$45,000.

*Ryan Reuter (PI). Elanco. Pilot Efficacy Study: Dose confirmation of performance with three different levels of monensin payout in a bolus for stocker cattle grazing wheat pastures. 9/28/2016 - 9/25/2017. \$183,084.

*Deb VanOverbeke (PI). NCBA. National Beef Quality Audit - Phase I. 10/1/2015 - 9/28/2017. \$58,730.

*Deb VanOverbeke (PI). TAMU. National Beef Quality Audit - Phase II. 10/1/2015 - 10/24/2017. \$18,000.

*Blake Wilson (PI). Iowa State University. Investigating the impact of anti-inflammatory drug treatment prior to shipping on homeostasis, immune function, and health of feedlot cattle. 7/1/2016 - 10/13/2017.

*Blake Wilson (PI). Multimin USA. Evaluation of MULTIMIN 90 injectable trace minerals on the performance, clinical brd incidence, and mineral balance in calves in a commercial feedlot. 10/29/2015 - 9/30/2017. \$49,996.

*Glenn Zhang (PI). OCAST. Development of next generation antibiotic alternatives. 8/1/2016 - 10/19/2017. \$87,065.

*Glenn Zhang (PI). Cowboy Tech. Natural immune boosting feed additives as alternatives to antibiotics. 1/1/2015 - 3/31/2017. \$60,000.

Research Publications

Ahlberg, C., K. Allwardt, A. Broocks, K. Bruno, A. Taylor, C. Krehbiel, *C. Richards, S. Place, *U. DeSilva, *D. VanOverbeke, R. Mateescu, and M. Rolf. 2017. Water Intake in Growing Beef Cattle. *Kansas Agricultural Experiment Station Research Reports* 3(1):14.

Albonico, M., L. Schutz, F. Caloni, C. Cortinovis, and *L. Spicer. 2017. In vitro effects of the *Fusarium* mycotoxins fumonisin B1 and beauvericin on bovine granulosa cell proliferation and steroid production. *Toxicon* 128:38-45.

Allwardt, K., C. Ahlberg, A. Broocks, K. Bruno, A. Taylor, S. Place, *C. Richards, C. Krehbiel, M. Calvo-Lorenzo, *U. DeSilva, *D. VanOverbeke, R. Mateescu, C. Goad, and M. Rolf. 2017. Technical note: Validation of an automated system for monitoring and restricting water intake in group-housed beef steers. *Journal of Animal Science* 95:4213.

Bayliff, C., M. Redden, J. Cole, A. McGee, C. Stansberry, M. Corrigan, W. Burdett, and *D. Lalman. 2017. Effects of Ralgro at branding and Revalor-G at weaning on growth performance of steer calves. *The Professional Animal Scientist* 33:108-112.

Boykin, C., L. Eastwood, M. Harris, D. Hale, C. Kerth, D. Griffin, A. Arnold, J. Hasty, K. Belk, D. Woerner, R. Delmore, J. Martin, *D. VanOverbeke, *G. Mafi, M. Pfeiffer, T. Lawrence, T. McEvers, T. Schmidt, R. Maddock, D. Johnson, C. Carr, J. Scheffler, T. Pringle, A. Stelzleni, J. Gottlieb, and J. Savell. 2017. National Beef Quality Audit–2016: In-plant survey of carcass characteristics related to quality, quantity, and value of fed steers and heifers. *Journal of Animal Science* 95:2993.

Boykin, C., L. Eastwood, M. Harris, D. Hale, C. Kerth, D. Griffin, A. Arnold, J. Hasty, K. Belk, D. Woerner, R. Delmore, J. Martin, *D. VanOverbeke, *G. Mafi, M. Pfeiffer, T. Lawrence, T. McEvers, T. Schmidt, R. Maddock, D. Johnson, C. Carr, J. Scheffler, T. Pringle, A. Stelzleni, J. Gottlieb, and J. Savell. 2017. National Beef Quality Audit – 2016: Survey of carcass characteristics through instrument grading assessments. *Journal of Animal Science* 95:3003.

Chen, Z., *D. Hagen, T. Ji, C. Elsik, and R. Rivera. 2017. Global misregulation of genes largely uncoupled to DNA methylome epimutations characterizes a congenital overgrowth syndrome. *Scientific Reports* 7(1):12667.

Chintagari, S., N. Hazard, G. Edwards, *R. Jadeja, and M. Janes. 2017. Risks Associated with Fish and Seafood. *Microbiology Spectrum* 5(1): doi:10.1128/microbiolspec.

Djimsa, B., A. Abraham, *G. Mafi, *D. VanOverbeke, and *R. Ramanathan. 2017. Effects of Metmyoglobin Reducing Activity and Thermal Stability of NADH-Dependent Reductase and Lactate Dehydrogenase on Premature Browning in Ground Beef. *Journal of Food Science* 82:304-313.

Eastwood, L., C. Boykin, M. Harris, A. Arnold, D. Hale, C. Kerth, D. Griffin, J. Savell, K. Belk, D. Woerner, J. Hasty, R. Delmore Jr, J. Martin, T. Lawrence, T. McEvers,

*D. VanOverbeke, *G. Mafi, M. Pfeiffer, T. Schmidt, R. Maddock, D. Johnson, C. Carr, J. Scheffler, T. Pringle, and A. Stelzleni. 2017. National Beef Quality Audit-2016: Transportation, mobility, and harvest-floor assessments of targeted characteristics that affect quality and value of cattle, carcasses, and by-products. *Translational Animal Science* 1:229-238.

Ervin, J., L. Schütz, and *L. Spicer. 2017. Current status of the role of endothelins in regulating ovarian follicular function: A review. *Animal Reproduction Science* 186:1-10.

Fan, P., P. Song, L. Li, C. Huang, J. Chen, W. Yang, S. Qiao, G. Wu, *G. Zhang, and X. Ma. 2017. Roles of Biogenic Amines in Intestinal Signaling. *Current Protein & Peptide Science* 18:532-540.

Fan, P., P. Song, L. Li, C. Huang, J. Chen, W. Yang, S. Qiao, G. Wu, *G. Zhang, and X. Ma. 2017. Roles of Biogenic Amines in Intestinal Signaling. *Current Protein & Peptide Science* 18:532-540.

Feng, T., L. Schutz, B. Morrell, M. Perego, and *L. Spicer. 2017. Effect of melatonin on bovine theca cells in vitro. *Reproduction, Fertility and Development*. <https://doi.org/10.1071/RD17203>.

Harris M., L. Eastwood, C. Boykin, A. Arnold, K. Gehring, D. Hale, C. Kerth, D. Griffin, J. Savell, K. Belk, D. Woerner, J. Hasty, R. Delmore Jr, J. Martin, T. Lawrence, T. McEvers, *D. VanOverbeke, *G. Mafi, M. Pfeiffer, T. Schmidt, R. Maddock, D. Johnson, C. Carr, J. Scheffler, T. Pringle, and A. Stelzleni. 2017. National Beef Quality Audit–2016: Transportation, mobility, live cattle, and carcass assessments of targeted producer-related characteristics that affect value of market cows and bulls, their carcasses, and associated by-products. *Translational Animal Science* 1:570-584.

Hasty, J., M. Pfeiffer, L. Eastwood, D. Gredell, C. Gifford, J. Levey, C. Cashman, D. Woerner, J. Martin, R. Delmore, W. Griffin, *D. VanOverbeke, *G. Mafi, C. Boykin, D. Hale, C. Kerth, D. Griffin, A. Arnold, J. Savell, D. Pendell, and K. Belk. 2017. National Beef Quality Audit-2016: Phase 1, Face-to-face interviews. *Translational Animal Science* 1:320-332.

*Jaroni, D. 2017. Inhibitory Activity of Plant-Derived Antimicrobials against Spoilage Microorganism, *Lactobacillus brevis*, on Organic Leafy Greens. *MOJ Food Processing & Technology* 4: doi: 10.15406/mojfpt.2017.04.00110.

*Jaroni, D., R. Kakani, S. Ravishankar, and *R. Jadeja. 2017. Efficacy of roselle (*Hibiscus sabdariffa*) calyx formulations against *Escherichia coli* O157:H7 during flume-washing of organic leafy greens. *Quality Assurance and Safety of Crops & Foods* 9:115-121.

Ke, Y., R. Mitacek, A. Abraham, *G. Mafi, *D. VanOverbeke, *U. DeSilva, and *R. Ramanathan. 2017. Effects of Muscle-Specific Oxidative Stress on Cytochrome c Release and Oxidation–Reduction Potential Properties. *Journal of Agricultural and Food Chemistry* 65:7749-7755.

- Li, D., T. Che, B. Chen, S. Tian, X. Zhou, *G. Zhang, M. Li, U. Gaur, Y. Li, M. Luo, L. Zhang, Z. Xu, X. Zhao, H. Yin, Y. Wang, L. Jin, Q. Tang, H. Xu, M. Yang, R. Zhou, R. Li, Q. Zhu, and M. Li. 2017. Genomic data for 78 chickens from 14 populations. *GigaScience* 6:1-5.
- Litt, P., and *D. Jaroni. 2017. Isolation and Physiomorphological Characterization of Escherichia coli O157:H7-Infecting Bacteriophages Recovered from Beef Cattle Operations. *International Journal of Microbiology* 2017:1-12.
- Litt, P., J. Brooks, and *D. Jaroni. 2017. Evaluation of Organic Acid-Based Sanitizers for Reduction of Escherichia coli O157:H7 during Flume-Washing of Organic Leafy Greens. *Food and Nutrition Sciences* 8:946-960.
- Liu, H., C. Hou, G. Wang, H. Jia, H. Yu, X. Zeng, P. Thacker, *G. Zhang, and S. Qiao. 2017. Lactobacillus reuteri I5007 Modulates Intestinal Host Defense Peptide Expression in the Model of IPEC-J2 Cells and Neonatal Piglets. *Nutrients* 9:559.
- Liu, Y., J. Bai, X. Xu, Z. Chen, *L. Spicer, and T. Feng. 2017. Effects of N-carbamylglutamate and l-arginine on gonadotrophin-releasing hormone (GnRH) gene expression and secretion in GT1-7 cells. *Reproduction, Fertility and Development*. <https://doi.org/10.1071/RD17265>.
- Martinez, H., A. Arnold, J. Brooks, C. Carr, K. Gehring, D. Griffin, D. Hale, *G. Mafi, D. Johnson, C. Lorenzen, R. Maddock, R. Miller, *D. VanOverbeke, B. Wasser, and J. Savell. 2017. National Beef Tenderness Survey–2015: Palatability and Shear Force Assessments of Retail and Foodservice Beef. *Meat and Muscle Biology* 1:138.
- Nair, M, *R. Ramanathan, G. Rentfrow, and S. Suman. 2017. Intramuscular variation in mitochondrial functionality of beef semimembranosus. *South African Journal of Animal Science* 47:635-639.
- Nerimetla, R., S. Krishnan, S. Mazumder, S. Mohanty, *G. Mafi, *D. VanOverbeke, and *R. Ramanathan. 2017. Species-Specificity in Myoglobin Oxygenation and Reduction Potential Properties. *Meat and Muscle Biology* 1:1.
- Perego, M., F. Caloni, C. Cortinovia, L. Schutz, M. Albonico, D. Tsuzukibashi, and *L. Spicer. 2017. Influence of a Roundup formulation on glyphosate effects on steroidogenesis and proliferation of bovine granulosa cells in vitro. *Chemosphere* 188:274-279.
- Prosperini, A., H. Berrada, M. Ruiz, F. Caloni, T. Coccini, *L. Spicer, M. Perego, and A. Lafranconi. 2017. A Review of the Mycotoxin Enniatin B. *Frontiers in Public Health* 5:304.
- *Reuter, R. 2017. Gamification of teaching livestock management skills. *Journal of Extension*. <https://joe.org/joe/2017october/iw3.php>.
- *Reuter, R., C. Moffet, G. Horn, S. Zimmerman, and M. Billars. 2017. Technical Note : Daily variation in intake of a salt-limited supplement by grazing steers. *The Professional Animal Scientist* 33:372-377.
- Scaglia, G., P. Beck, *D. Lalman, and F. Rouquette. 2017. Invited Review : Issues affecting research and extension programs on cow-calf and stocker cattle production in the Southeast region of the United States. *The Professional Animal Scientist* 33:310-319.
- Schutz, L., L. Zhang, B. Morrell, N. Schreiber, C. Cortinovia, P. Aad, M. Totty, J. Gilliam, F. Caloni, and *L. Spicer. 2017. 117 Fibroblast Growth Factor Receptor-1c, -2c, -3c, and -4 mRNA Abundance in Granulosa Cells during Follicular Growth in Cattle. *Reproduction, Fertility and Development* 29:167.
- *Spicer, L., L. Schütz, J. Williams, N. Schreiber, J. Evans, M. Totty, and J. Gilliam. 2017. G protein-coupled receptor 34 in ovarian granulosa cells of cattle: changes during follicular development and potential functional implications. *Domestic Animal Endocrinology* 59:90-99.
- Totty, M., B. Morrell, and *L. Spicer. 2017. Fibroblast growth factor 9 (FGF9) regulation of cyclin D1 and cyclin-dependent kinase-4 in ovarian granulosa and theca cells of cattle. *Molecular and Cellular Endocrinology* 440:25-33.
- Vijayakumar, P., and *P. Muriana. 2017. Inhibition of Listeria monocytogenes on Ready-to-Eat Meats Using Bacteriocin Mixtures Based on Mode-of-Action. *Foods* 6:22.
- Wills, K., R. Mitacek, *G. Mafi, *D. VanOverbeke, *D. Jaroni, *R. Jadeja, and *R. Ramanathan. 2017. Improving the lean muscle color of dark-cutting beef by aging, antioxidant-enhancement, and modified atmospheric packaging1. *Journal of Animal Science* 95:5378-5387.
- Wilson, B., *C. Richards, D. Step, and C. Krehbiel. 2017. Best management practices for newly weaned calves for improved health and well-being. *Journal of Animal Science* 95:2170.
- Wilson, B., D. Step, C. Maxwell, C. Gifford, *C. Richards, and C. Krehbiel. 2017. Effect of bovine respiratory disease during the receiving period on steer finishing performance, efficiency, carcass characteristics, and lung scores. *The Professional Animal Scientist* 33:24-36.
- Xiao, Y., C. Wu, K. Li, G. Gui, *G. Zhang, and H. Yang. 2017. Association of growth rate with hormone levels and myogenic gene expression profile in broilers. *Journal of Animal Science and Biotechnology* 8(1):43.
- Zapata, R., A. Singh, *A. Pezeshki, T. Nibber, and P. Chelikani. 2017. Whey Protein Components - Lactalbumin and Lactoferrin - Improve Energy Balance and Metabolism. *Scientific Reports* 7(1):9917.
- ZeidAli-Nejad, A., G. Ghorbani, S. Kargar, A. Sadeghi-Sefidmazgi, *A. Pezeshki, and M. Ghaffari. 2017. Nutrient intake, rumen fermentation and growth performance of dairy calves fed extruded full-fat soybean as a replacement for soybean meal. *Animal*:1-8.
- Zhang, L., L. Schütz, C. Robinson, M. Totty, and *L. Spicer. 2017. Evidence that gene expression of ovarian follicular tight junction proteins is regulated in vivo and in vitro in cattle. *Journal of Animal Science* 95:1313.

Invited Presentations

Udaya DeSilva. “It is the bugs; It is always the bugs.” Veterinary Biomedical Sciences Seminar Series, Center of Veterinary Health Sciences, OSU. Stillwater, OK. 4/13/17.

Udaya DeSilva. “Microbiomes of the Canine and Equine Reproductive Tracts.” Gluck Equine Research Center, University of Kentucky. Lexington, KY. 4/20/2017.

Udaya DeSilva. “The Role of Microbiomes in Animal Production and Health.” Department of Animal Science and Industry, Kansas State University. Manhattan, KS. 10/18/2017.

Udaya DeSilva. “The Myth of the Sterile Womb; Microbiomes of the Canine and Equine Reproductive Tracts.” 23rd Annual Kiracofe Lecture, Kansas State University. Manhattan, KS. 10/19/2017.

Gerald Horn and Ryan Reuter. “Free-choice supplementation for beef cattle.” 2017 Summit – Delivery Systems for Protein and Energy Supplements, Southern Section of American Society of Animal Science. Franklin, TN. 2/4/2017.

Ravi Jadeja. “Food Defense Plan 101.” AAFP Annual Meeting. Springdale, AR. 9/20/17.

Ravi Jadeja. “Third Party Audit and You.” MIO Emerging Committee group meeting. Oklahoma City, OK. 8/4/17.

David Lalman. “Fall stockpiling options and management for extending the grazing season.” Southern Section, American Society of Animal Science. Franklin, TN. 2/6/2017.

David Lalman. “Issues affecting research and extension programs on cow-calf and stocker cattle production in the Southeast region of the United States.” Southern Section, American Society of Animal Science. Franklin, TN. 2/5/2017.

David Lalman. “Developing a Cow Herd that Fits Your Ranch Environment.” World Cattlemen’s Congress, North Dakota State University. Dickinson, ND. 9/1/2017.

David Lalman. “Trends in the American Cattle Industry; Research Advancements in the Last 30 Years.” International Agricultural Expo, University of Debrecen and International Charolais Association. Debrecen, Hungary. 8/20/2017.

Adel Pezeshki. “Effects of low protein diets on energy balance and metabolic health.” Institute of Food Technologists (IFT) Meeting. Las Vegas, NV. 6/28/2017.

Ranjith Ramanathan. “Metabolomics of Beef Color.” Meat and Muscle Biology concurrent session at the American Meat Science Association Reciprocal Meat Conference. College Station, TX. 6/18/17.

Ryan Reuter. “Precision supplementation and new technology in managing grazing.” National Meeting of American Society of Animal Science. Baltimore, MD. 7/8/2017.

Leon Spicer. “Using microarrays to identify new gene candidates that may be involved in follicular development and ovarian cyst formation.” Institute of Animal Science of the Animal and Dairy Science Cluster, University of the Philippines. Los Banos, Philippines. 6/8/17.

Glenn Zhang. “Developing antibiotic alternatives: immune modulation or microbiome manipulation?” Department of Microbiology and Molecular Genetics, Oklahoma State University, Stillwater, OK. 4/17/17.

Glenn Zhang. “Development of next-generation antibiotic alternatives.” College of Animal Science & Nutritional Engineering, Wuhan Polytechnic University, Hubei, China. 12/13/17.

Glenn Zhang. “A new class of antibiotic alternatives for poultry use.” Zhejiang Academy of Agricultural Sciences, Hangzhou, China. 12/15/17.

Glenn Zhang. “Novel approaches to the development of alternatives to antibiotics.” College of Animal Science and Technology, China Agricultural University, Beijing, China. 12/21/17.

President’s Cup

Ryan Reuter and Chris Richards were part of a group that received the President’s Cup for Creative Interdisciplinarity for their project, titled “Low Maintenance Livestock Monitoring via Environment Powered Internet of Things,” at the 2017 University Awards Convocation.

The goal of the project was to develop a comprehensive, integrated livestock monitoring system to help ranchers and dairy farmers monitor important individual animal and field management parameters of their animals, including all-around health and location of livestock. This monitoring system would improve production efficiency, human quality of life, and animal well-being. A holistic approach is being followed for designing and developing an integrated animal monitoring system that uses the *internet of things* technologies, and state-of-the-art energy harvesting methods to overcome battery life challenges. The project involved the collaboration among multi-disciplinary research team members, which include expertise from ECE, Animal Science, Agricultural Engineering, and Entrepreneurship to realize the best possible livestock monitoring and management system.



ASAS Research Award

Ranjith Ramanathan was recognized with the 2018 Outstanding Young Animal Scientist Research Award at the ASAS Southern Section Meeting. In 2017, he was also recognized with the 2017 Outstanding Young Animal Scientist Education Award.



Patent Filed

Glenn Zhang's research efforts have led to development of intellectual properties for OSU with strong potential for commercialization. Through systemic screening of the genomes of multiple animal species, his group has identified a number of small host defense peptides with direct antibacterial activities but a low risk of triggering resistance.

He has conducted a series of structure-activity relationship studies and revealed the potential of these small peptides and their analogs as novel antimicrobials against a wide range of agriculturally important pathogens, including drug-resistant strains. A U.S. patent on one of these peptides, named rattusin, was issued in April 2009.

Simultaneously, Zhang's team has developed a high-throughput screening for discovery of small-molecule compounds with the ability to enhance endogenous host defense peptide synthesis, animal innate immunity, and disease resistance. As a result, a large group of natural and synthetic compounds have been identified with potential to be developed as cost-effective, antibiotic alternatives to disease control and prevention for livestock use.

A utility patent, entitled "Immune Boosting Dietary Compounds for Disease Control and Prevention," was filed by OSU on March 8, 2017. A U.S. animal nutrition company is in the process of signing an option agreement with OSU on joint development of this technology.

Visiting Scholars/Faculty

Nicholas Bellitto from the Department of Health, Animal Science and Food Safety, University of Milan, Italy worked in Leon Spicer's lab from February to May, 2017. His research focused on the hormonal regulation of steroidogenesis and proliferation of feline granulosa cells.

Binlong Chen arrived in the Zhang lab as a joint Ph.D. student in September 2016. He came from College of Animal Science and Technology at Sichuan Agricultural University, China. He is being sponsored by China Scholarship Council, Ministry of Education, China and will spend two years at OSU. He has been working on dietary modulation of chicken immunity and gut microbiome.

Tao (Philip) Feng from the Institute of Animal Husbandry and Veterinary Medicine, Beijing Academy of Agriculture and Forestry Sciences, Beijing, China worked in Leon Spicer's lab from March 2016 to March 2017. His research focused on the metabolite and hormonal regulation of steroidogenesis, proliferation, and gene expression of bovine granulosa and theca cells.

Thiago Sakomoto Belem is a visiting scholar from Brazil, Thiago Belam. He is currently conducting research in Ranjith Ramanathan's lab focusing on factors affecting myoglobin denaturation.

Kan Xiao joined the Zhang lab as a joint Ph.D. student in October 2016. She came from College of Animal Science and Technology at Zhejiang University, China, which also sponsored her study at OSU. Kan spent one year at OSU working on the development of alternatives to antibiotics.

A visiting scientist from China, **Daihua Qi** worked in Udaya DeSilva's laboratory for four months this year. He analyzed soil samples from an arid region in China for its fungal biodiversity. A manuscript has been submitted based on this work.

Alejandro Francisco La Manna joined our department in August of 2017 as a post-doctoral fellow and visiting scientist. He is originally from Uruguay where he is the lead scientist for assessment of the water footprint of the dairy industry at the National Institute for Agricultural Research (INIA). He will be working with Ryan Reuter for the next year, conducting and aggregating research data generated in the Grazing CAP project, entitled, "Resilience and vulnerability of beef cattle projection in the Southern Great Plains under changing climate, land use and markets."

Xiangbing Mao became a member of the Zhang lab in December 2016. He is an associate professor on leave from Institute of Animal Nutrition, Sichuan Agricultural University, Chengdu, China. He is being funded by China Scholarship Council, Ministry of Education, China. Mao is working on the development of alternatives to antibiotics.

Graduate Research

CASNR 3-Minute Thesis Competition

Four graduate students from the Department of Animal Science swept the top four spots in the 2017 CASNR 3 Minute Thesis finals. Sabra Billups (Ravi Jadeja's lab) placed 1st and received \$300, Conner McDaniel (Ravi Jadeja's lab) placed 2nd and received \$200, Audrey Boeken (Peter Muriana's lab) and Kelsy Robinson (Glenn Zhang's lab) tied for 3rd and each received \$100.

Sabra Billups and Conner McDaniel both went on to represent CASNR in the University 3-Minute Thesis Competition on November 15th, 2017. Lindsay King also represented CASNR in the University 3-Minute Presentation Competition on November 2nd, 2017 at the Student Union Theater.



Team Ranks in Top Ten at App Competition

A team consisting of Joyjit Saha, Divya Jaroni, Morgan Pfeiffer, Gretchen Mafi, and Ravi Jadeja submitted an app idea, titled "STTEAK (Safe Temperature and Tenderness Estimator At a Klick)," into the From Research to App Competition organized by OSU Research and OSU App Development on November 3rd, 2017.

STTEAK is a APP-based solution to beef packers and retailers that intend to save millions of dollars being spent for its cooking validation studies by providing low-cost technology solution. It also aims at consumers finding out tenderness and cooking instructions for a steak.

Approximately 80 ideas were submitted in the first round of the competition. The team was selected as one of the top ten app ideas and was positioned 3rd to 9th. The team won a \$500 reward and the opportunity to develop STTEAK into a fully functioning app from OSU App Development.

FAPC Research Symposium - Graduate Categories

FAPC held its annual research symposium on February 20th, 2018. In Graduate Poster Presentations, Sabra Billups received 1st place, Manish Aryal tied for 2nd, and Audrey Boeken received 3rd place. In Graduate Oral Presentations, Joyjit Saha received 1st place. All are food science students in our graduate program.



Presentations

Matt Beck. "Whole cottonseed supplementation improves performance and reduces emission intensity of grazing beef cattle." ASAS-Southern Section, Franklin, TN. 2/6/2017.

Luis Schutz. "Fibroblast growth factor receptor-1c, -2c, -3c, and -4 mRNA abundance in granulosa cells during follicular growth in cattle." International Embryo Transfer Society 2017 Annual Meeting, Austin, TX. 1/16/2017.

Morgan Pfeiffer. "Effects of temperature abuse on shelf life and color stability on beef products." American Meat Science Association Annual Reciprocal Meat Conference, College Station, Texas. 6/15/2017.

Kendra Wills. "Effects of aging, antioxidant-enhancement, and modified atmospheric packaging on the appearance of dark-cutting beef." American Meat Science Association Annual Reciprocal Meat Conference, College Station, Texas. 6/15/2017.

Rachel Mitacek. "Effects of modified atmosphere packaging on surface color of dark-cutting beef." Presented at the Institute of Food Technologists Annual Meeting, Las Vegas, Nevada. 6/25/2017.

Kiefer Peckham. "The effect of aging time on metmyoglobin reducing activity." American Meat Science Association Annual Reciprocal Meat Conference, College Station, Texas. 6/15/2017.

Katelyn Brennecke. "Effects of lactate-enhancement on beef muscle structure." Institute of Food Technologists Annual Meeting, Las Vegas, Nevada. 6/25/2017.

AMSA Publication

"When meat meets math - Predictive modeling to determine safe cooking times of tenderized beef steaks" by Joyjit Saha, Divya Jaroni, Ravi Jadeja, and Jacob Nelson was selected by the American Meat Science Association and published as AMSA Editors Exclusive in Meating Place (available online at <http://www.meatingplace.com/Industry/TechnicalArticles/Details/68646>).

Women's Faculty Council Student Research Award

Pushpinder Litt received the Women's Faculty Council Student Research Award in April of 2017 and the OSU Graduate College's Summer Dissertation Fellowship (June - July 2017). She was also a finalist at the 2017 Developing Scientist Competition. In 2016, she received the Developing Scientist Award for her technical presentation at the 2016 International Association for Food Protection (IAFP) Annual Meeting.



USDA Pre-Doctoral Fellowship

Kelsy Robinson, a doctoral student in Glenn Zhang's lab, received a highly prestigious USDA Predoctoral Fellowship that is worth \$95,000 for two years from 2018 to 2019. The title of her fellowship research is "Fecal Microbiota Transplantation to Enhance Production Efficiency." The Fellowship was awarded competitively from around the United States based on the quality of proposed research as well as the credentials and leadership potential of the applicant.



Kelsy Robinson also won the Graduate Student Research Paper Certificate of Excellence Award from Poultry Science Association in July 2017, as well as 2016. The certificates are presented in recognition of students who have presented high-quality research papers at the annual meeting.

Whiteman Research Awards

The 31st Annual Whiteman Award Competition was held February 21st, 2017.

Kendra Wills received first place. Her presentation was titled "Aging, antioxidant-enhancement, and modified atmospheric packaging improves appearance of dark-cutting beef."

Kelsy Robinson received second place. Her presentation was titled "Butyrate and forskolin modulate intestinal barrier and immune function in broiler chickens."

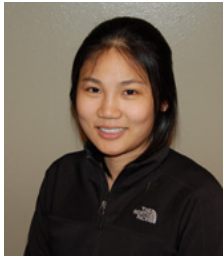
Pushpinder Litt received third place. Her presentation was titled "Phage application for removal of Shiga-toxicogenic Escherichia coli biofilms on inanimate farm surfaces."

Winners of the 2018 competition will be announced during the 2018 Animal Science Banquet in April.



Thesis & Dissertations

The following students graduated with an M.S. or Ph.D. in spring, summer, or fall of 2017.



Pornpim Aparachita graduated in the fall of 2017 with an M.S. in animal science (nutrition focus). She was advised by Scott Carter. Her thesis was titled, "Determination of the efficacy of titrated levels of water soluble zinc on growth performance and immune response of nursery pigs."



Pushpinder Litt graduated in the fall of 2017 with a Ph.D. in food science. She was advised by Divya Jaroni. Pushpinder was a CIE Scholar for the Fall 2017 semester and participated in 2017 QMRAIII. Her thesis was titled, "Isolation and characterization of Shiga-Toxigenic Escherichia Coli specific bacteriophages and their application in the food industry."



Manish Aryal graduated in the fall of 2017 with an M.S. in food science. He was advised by Peter Muriana, and received a Unitherm Food Systems Fellowship working with biofilms and microbial validation of food processing equipment. His thesis was titled, "Microplate lethality assay to determine the efficacy of commercial sanitizers for inactivation of *Listeria monocytogenes*, *Escherichia coli* O157:H7, and *Salmonella* in biofilms." He is now working on his Ph.D. at OSU.



Rachel Mitacek graduated in the fall of 2017 with an M.S. in food science. She was advised by Ranjith Ramanathan. Her thesis was titled, "Effects of aging on metabolite profile." She served as a student representative for the Muscle Foods Division, Institute of Food Technologists.



Matt Beck graduated in the summer of 2017 with an M.S. in animal science (nutrition focus). He was advised by Ryan Reuter. Matt received the 2017 John Hughes Distinguished Graduate Student Scholarship. His thesis was titled, "Nutritional management of enteric methane emissions from grazing beef cattle." He plans to pursue a Ph.D.



Breanne Morrell graduated in the spring of 2017 with an M.S. in animal science (reproductive physiology focus). She was advised by Leon Spicer. Her thesis was titled, "E2F transcription factors: Possible role in follicular development of cattle." She is now attending the OSU Center for Veterinary Health Sciences to pursue her D.V.M.



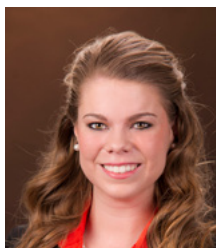
Chance Billups graduated in the spring of 2017 with an M.S. in animal science (meat science focus). He was advised by Gretchen Mafi. His thesis was titled, "Prediction of beef quality of steaks and carcasses using Bioelectrical Impedance analysis." He now works for Tyson Foods at their discovery center in Springdale, AR.



Silvia Schaaf graduated in the spring of 2017 with an M.S. in animal science (nutrition focus). She was advised by Scott Carter. Her thesis was titled, "Effect of dietary source and concentrations of copper, manganese, and zinc on growth performance and immune response of nursery pigs."



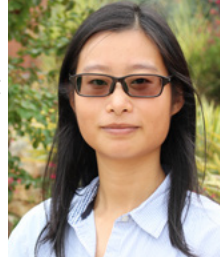
Zhuo (Judy) Deng graduated in the fall of 2017 with a Ph.D. in animal science (molecular biology focus). She was advised by Glenn Zhang. Her thesis was titled, "High throughput screening for small-molecule compounds that induce host defense peptide expression."



Sarah Schobert graduated in the spring of 2017 with an M.S. in animal science (nutrition focus). She was mentored by Steven Cooper. Her thesis was titled, "Probiotic supplementation effects on performance, body composition, and energetic efficiency of broilers under thermo-neutral and heat stress conditions."



Cedrick Shili graduated in the summer of 2017 with an M.S. in animal science (nutrition focus). He was advised by Scott Carter. His thesis was titled, "Effect of dietary selenium and vitamin e on growth performance and immune response of nursery pigs following an immune challenge." He is now pursuing a Ph.D. at OSU.



Xuwen Weineke graduated in the fall of 2017 with an Ph.D. in animal science. She was advised by Udaya DeSilva. Her thesis was titled, "Temporal change in soil microbiome under the influence of eight years of manure amendment in cultivated soils." She is now a R&D scientist at Merieux Nutrisciences in Chicago, IL.



Courtney Spencer graduated in the fall of 2017 with an M.S. in animal science (nutrition focus). She was advised by David Lalman. Her thesis was titled, "The relationship of maternal dietary energy intake to milk production, body composition, and efficiency of calf growth."



Garrett Williams graduated in the summer of 2017 with an M.S. in animal science (nutrition focus). He was advised by Ryan Reuter. Garrett plans to work in the feedlot industry. His thesis was titled, "Intake variation of range supplements."



Logan Thompson graduated in the fall of 2017 with an M.S. in animal science. He was advised by Ryan Reuter. His thesis was titled, "Quantifying enteric methane emissions from stocker cattle grazing winter wheat."



Kendra Wills graduated in the spring of 2017 with an M.S. in animal science (meat science focus). She was advised by Ranjith Ramanathan. Her thesis was titled, "Effects of aging, antioxidant-enhancement, and modified atmospheric packaging on appearance of dark-cutting beef." She is now attending law school.



Morgan Totty graduated in the fall of 2017 with an M.S. in animal science (physiology focus). She was advised by Leon Spicer. Her thesis was titled, "Fibroblast growth factor 9 regulation of cyclin D1 and cyclin-dependent kinase-4 in ovarian granulosa and theca cells of cattle."



Mariah Woolsoncroft graduated in the summer of 2017 with an M.S. in animal science (nutrition focus). She was advised by Blake Wilson. Her thesis was titled, "Effects of roughage source and exercise during receiving and corn processing method during finishing on health, performance, and carcass characteristics of beef steers." She plans to pursue a career in animal science in Kansas.

Interested in our Graduate Program?

If you desire to continue your education beyond a bachelor's degree, our department offers Master of Science (M.S.) and Doctor of Philosophy (Ph.D) degree programs in both animal science and food science. We have over 50 students currently enrolled in our graduate student program.

An M.S. option allows students to obtain a master's via a more traditional route, including a combination of coursework and research. A Master of Agriculture (M.Ag.) degree is also available, but is considered a terminal degree and not suggested if you desire to pursue an additional degree upon completion.

Learn more about our graduate program on our website at <http://www.ansi.okstate.edu/academics/graduate>.

Undergraduate Research

Below are students currently involved in our undergraduate research scholar program.

Abigail Bechtold

Mentor: Ranjith Ramanathan
Project: Comparison of Myoglobin, Hemoglobin and Cytochrome C Oxidation Properties

Emily Bechtold

Mentor: Ranjith Ramanathan
Project: Species Specific Myoglobin Oxidation and Reduction

Sage Becker (Niblack Research Scholar)

Mentor: Glenn Zhang
Project: Novel Alternatives to Antibiotics with the Ability to Enhance Animal Immunity and Disease Resistance

Mind Bracy

Mentor: Scott Carter
Project: The Effect of a Combination of Organic Acids and Plant Extracts on the Immune Response of Nursery Pigs

Jessie Brown

Mentor: Scott Carter
Project: Effects of Cortisol Levels on the Growth and Performance of Nursery Pigs

Jacob Burch-Konda

Mentor: Adel Pezeshki
Project: Interaction of Dietary Herbanimal Supplement with Protein to Improve the Performance and Health of Nursery Pigs

Haden Comstock

Mentor: Ranjith Ramanathan
Project: The Effects of pH and Temperature on Non-Enzymatic Reduction of Myoglobin

Jordan Cowger

Mentor: Glenn Zhang
Project: Characterization of Host-Defense Peptide Inducing Compounds in Human HT29 Cells

Molly Drakeley

Mentor: Ryan Reuter
Project: Efficacy of a Fecal DNA-Based Method to Measure Diet Components in Cattle

Amber Hemple

Mentor: Leon Spicer
Project: Fibroblast Growth Factor Receptor Gene Expression in Granulosa and Theca Cells

Samantha Howe

Mentor: Udaya DeSilva
Project: Isolation and Characterization of Naturally Occurring Bacteria from Equine Uterus

Larissa Koslowski

Faculty Mentor: Chris Richards
Graduate Student Mentor: Kelsey Bruno
Project: Beef Cattle Selection and Management of Adaptation to Drought

Jacqueline Nichols

Mentor: Leon Spicer
Project: Factors Influencing Vascular Endothelial Growth Factor Expression in Ovarian Cells

Jessie Payne

Mentor: Danielle Bellmer
Project: Encapsulation of Algal Proteins to Improve Sensory Properties

Charley Rayfield

Mentor: Ravi Jadeja
Project: Additive Effects of Paraacetic Acid and Sodium Acid Sulfate to Reduce E. coli O157:H7 from Beef Trimmings

Morgan Sarchet

Faculty Mentor: Divya Jaroni
Grad Student Mentor: Joyjit Saha
Project: Biofilm-Forming Capabilities and Dispersal of Wild Type Escherichia Coli o157:-H7, Using Various Chemical and Bacteriophage Treatments

Angelica Smith and Kristen Slupsky

Mentor: Adel Pezeshki
Project: Effect of Graded Level of Phytase on Growth Performance of Nursery Pigs Fed with Moderately Low Protein Diets

Nicole Stevenson (*Freshman Research Scholar*)

Mentor: Chris Richards
Graduate student mentor: Kelsey Bruno
Project: The Effects of Water Restriction on Shade Seeking Behavior in Beef Cattle

Sarah Vue

Mentor: Glenn Zhang
Project: Natural Antibiotic Alternatives to Boost Animal Immunity and Disease Resistance

Developing Scientist Award

Beata Mackenroth won 1st place in the 2017 Developing Scientist Award for her poster presentation in the undergraduate section at the International Association for Food Protection meeting at Tampa FL.

Beata also received the 2017 Wentz Semester-Long Scholarship for her project titled, "Examining the Mechanism of Biofilm Disruption by Shiga-toxigenic Escherichia coli-Specific Bacteriophage," and a Niblack Scholarship (Fall-2016 –Summer-2017) for her project titled "Inhibition of Shiga-toxigenic Escherichia coli Biofilms using Novel Bacteriophages and Associated Enzymes."



FAPC Research Symposium Undergraduate Categories

FAPC held its annual research symposium on February 20th, 2018. Morgan Sarchet, food science major in the Department of Animal Science, received 2nd place in the undergraduate poster presentations section of the competition. She is mentored by Divya Jaroni.

Fulbright U.S. Student Award

Sydney Stewart was recognized with the Fulbright U.S. Student Award to study/research in Germany, Bureau of Educational and Cultural Affairs, U.S. Department of State (2017-2018). The Fulbright program places U.S. students in countries around the world to work with research advisers and learn about a new culture. Sydney was a 2016 -2017 Wentz Research Scholar.



Goldwater Scholarship Nominee

Sage Becker, an undergraduate research scholar in Glenn Zhang's lab, was a 2018 Institutional Nominee for the Goldwater Scholarship at OSU. This prestigious undergraduate scholarship is awarded to approximately 300 college sophomores and juniors across the nation each year.

Sage is a junior majoring in animal science (animal biotechnology degree option) and has been researching in Zhang's lab since her freshman year. She was initially a University Freshman Research Scholar and then received a Wentz Research Scholarship. She is currently a 2017 - 2018 Niblack Undergraduate Research Scholar.



Heritage Ranch Scholarship

Established in 2016 by James Bertelsmeyer of Tulsa, Oklahoma. Jim and his family own Heritage Ranch near Bristow, Oklahoma. He and his wife Glenda became involved with OSU Animal Science through the Master Cattlemens program. The Ranch serves as an opportunity to teach their grandchildren about agriculture, much like Jim was raised when he visited his grandfather's farm as a child. The Bertelsmeyers take pride in their ranch and the improvements they have made to the land as a result of the Master Cattleman Program. This has allowed them to make significant increases in their cow numbers. The Heritage Ranch Scholarship was established to support students in Animal Science who have expressed interest in beef production and management. The recipient(s) volunteers weekly at the OSU Range Cow Research Center. To learn more, please contact the OSU Foundation.

Novel Alternatives to Antibiotics

Written by Sage Becker

I've been working in Dr. Glenn Zhang's lab in the Department of Animal Science since my freshman year. Over the past 3 years, I have been a University Freshman Research Scholar, a Lew Wentz Undergraduate Research Scholar, and now I am a Niblack Research Scholar. In addition to working with Dr. Zhang, I work closely with Kelsy Robinson and Wentao Lyu, my graduate mentors. All three of them constantly answer my questions and help me with anything that I need for my projects. The goal of my research is to find novel alternatives to antibiotics through dietary modulation in order to counteract antimicrobial resistance.

Livestock producers routinely administer various low-dose antibiotics in feed or water to promote animal growth and prevent disease. However, over the years, bacteria have developed increased resistance to the antibiotics used. Therefore, to ensure animal health and performance, there is a need for novel alternative approaches to treat and prevent infectious diseases. Although many different types of antibiotic alternatives are being used in the industry, none have proven as effective as

antibiotics. Alternatives that are highly effective against a broad spectrum of pathogens while also minimally triggering bacterial resistance are needed.

This is where my research comes in. Zhang's lab has developed a novel cell-based high throughput screening assay and identified a number of small-molecule compounds with the ability to induce the expression of the genes for host defense peptides (HDPs), which are produced by the innate immune system and protect the host from infections. Dietary modulation of HDP synthesis has emerged as a promising antibiotic alternative approach to disease control and prevention.

I am currently working on a few projects in Zhang's lab. For the first, I will be testing the effects of a few selected dietary compounds on intestinal epithelial cells and their ability to induce HDP gene expression. I am just getting started on this project and all the details are still being developed.

The other project I will be working on later in the semester is part of a larger project. Our lab is preparing to test the

efficacy of a proprietary compound, both alone and in combination with butyrate, in disease control and prevention. The plan is to supplement different doses of these compounds in the feed, followed by a bacterial challenge using a chicken model of necrotic enteritis previously developed in our lab. We are anticipating a synergistic effect between the compound and butyrate.

I chose to do the project in porcine cells because I wanted to continue testing dietary compounds, but I wanted to do it in a different species. Dr. Zhang gave me the option to do a project in chicken, pig, or human cells and I chose pig cells because I have never worked with them in the lab and in the future I want to conduct research in swine. Also, this research is important because it could potentially prove that dietary modulation of HDPs is possible in multiple livestock species, not just chickens.

I decided to be a part of the work on the disease challenge because it is one of the final steps in a large project many people in the lab, including myself, have been working on. By doing the disease challenge, we are hoping to confirm that the compound we are testing will not have a negative impact on animal production performance and to determine if it has the ability to decrease the duration or severity of infection. The entire project, from the initial screening all the way to the disease challenge, is important because we are trying to find alternatives to antibiotics in order to counteract growing antimicrobial resistance.

The ultimate research goal for me and the rest of Zhang's lab is to develop these HDP-inducing compounds as novel alternatives to antibiotics for use in poultry and other livestock animals.



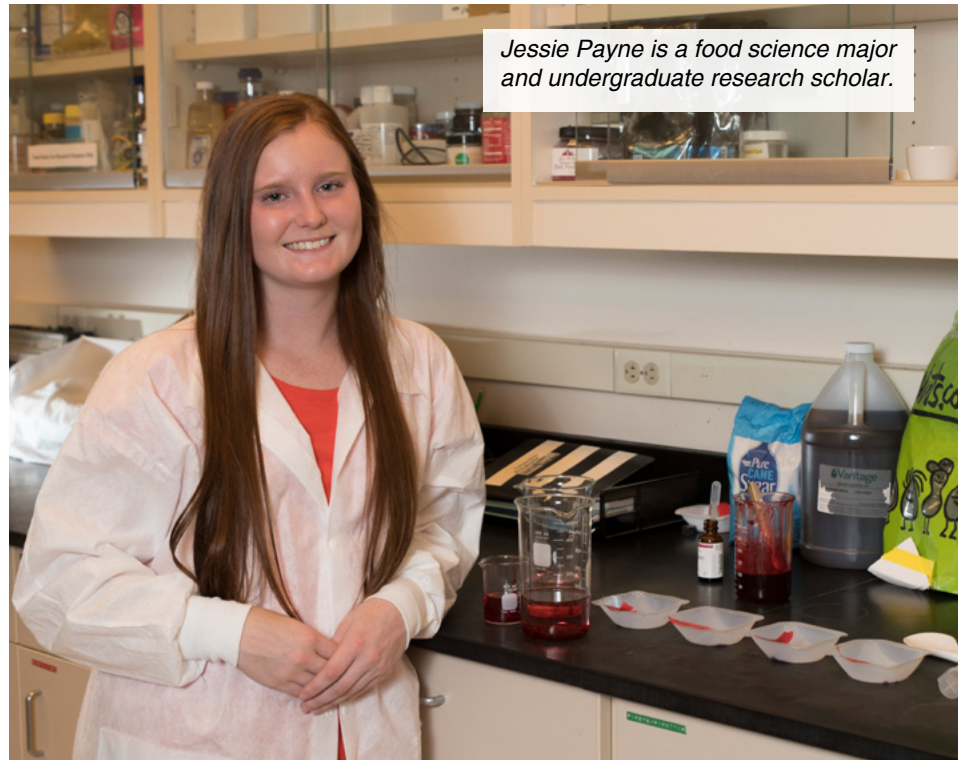
Sage Becker is an animal science major and Niblack Research Scholar.

Encapsulation of Algal Proteins to Improve Sensory Properties

Written by Jessie Payne

My research involves encapsulation of high nutrient powders. I chose this research because I am very interested in molecular gastronomy and how it's something not a lot of people work with. This research is very important because people all around the world do not have the right amount of nutrients in their diet. They are deficient in a lot of vital nutrients and this is something I am passionate about. People chose to not eat vegetables because they do not like the taste, but they do not realize how important they are in our diets.

Molecular gastronomy is a new phenomenon that has overtaken the food industry. This is defined as the exploration of the physical and chemical properties and possible transformations of food. One of these culinary practices is called spherification, which is the shaping of a liquid into a sphere. 'Boba-balls' are an example of this technique and are a common topping at ice cream shops. The goal of this research was to create a product that contained high-nutrients inside of them.



Jessie Payne is a food science major and undergraduate research scholar.

The objective was to encapsulate vegetable powders to create a healthier 'boba ball,' but to have them be incorporated into other food products such as cookies or muffins. Some important information that was identified was the ingredients used, and the nutrition of the general product (such as added sugar).

The initial trials of this project consisted of a trial and error type research to correctly identify the amount of ingredients. Different kinds of vegetable powders and amounts of these powders were also taken into consideration. Various trials were run to test durability, coating, flavoring, and overall preservation of the beads.

Some of the challenges in this research is getting the right concentration of all the ingredients (that is why my original focus was to make a 'beet bead' recipe). The original way I made these beads had a very salty after taste due to the calcium chloride we were using, so we switched to calcium lactate and this removed the salty flavor. The salty

flavor can be useful if you are putting it into different foods that need salt added, but you would not have to add the salt if you added the bead to the recipe.

Though this project is not over, the expected results are that it will be used for those individuals that are lacking in nutrients and can incorporate these 'beads' into their diet. The significance of this research is that it gives a fun alternative to those that need certain nutrients in their lives. This could also be done with other kinds of high-nutrient foods such as protein and fruits. Current research has proven that it is possible to encapsulate many nutritious foods.

My personal goal with this research is to create a healthy boba ball, or 'bead,' that can be incorporated into the everyday diets of individuals that are lacking in nutrients. I hope these beads can be a good and fun way for people to eat the vegetables that they need without actually having to eat vegetables.

BOBA-BALL INGREDIENTS

Beet Solution

.795g Sodium Alginate
25g Beet Powder
10g Sugar
150ml Water

Bath Solution

10.5g Calcium Chloride
150ml Water
or
11.2g Calcium Lactate
150ml Water

CLEAVER CLUB

MEAT US AT A MILLION

Oklahoma State University's Meat Judging Program began in 1926 and has achieved 18 National Championships – more than any university.

In addition to this success, team members cultivate critical thinking and communication skills, and develop the confidence and self-discipline to become future leaders. Most importantly, judging teams create friendships and relationships that members and coaches cherish for a lifetime.

**The Meat Judging Cleaver Club Endowed Fund (21-00350)
was developed to continue this tradition of excellence.**

**Join the ASAA in honoring Dr. Gerald Horn and Dr. Bob Wettemann
with the 2018 Totusek Arena, Hall of Fame Chairback!**

In recognition of their Hall of Fame Chairback, Drs. Horn and Wettemann request support be provided towards the **Undergraduate Research Scholars Research Program**.

The purpose of the **Undergraduate Research Scholars Research Program** is to provide hands-on research experience for animal and food science undergraduate students. Students develop a greater appreciation and understanding of the research process and sharpen their decision-making and oral and written communications skills. The program helps to prepare students for employment and to become the next generation of animal and food scientists.

Earnings from this endowment will be used for:

- Stipends for students enrolled in the Animal Science Undergraduate Research Scholars Program
- Lab and/or animal supplies and publication and poster printing costs for students' research projects
- Student travel to scientific meetings for presentation of their research or to visit locations to learn specific techniques

To contribute, please fill out the below contribution form and return to the Animal Science Alumni Association.

Your Information:

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Your Gift: The ASAA will match funds raised up to \$12,500 to the Program Please send your payment to:

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Animal Science Alumni Association

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THURSDAY, APRIL 5, 2018

GRAND OPENING OF THE

Freestall Barn & Helms Hall

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Department of
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