# Phi Zeta
# RESEARCH DAY
## KANSAS STATE UNIVERSITY

## March 11, 2025

The Sigma Chapter of Phi Zeta, est. 1969

**Phi Zeta RESEARCH DAY**
**KANSAS STATE UNIVERSITY**

**March 11, 2025**
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**Schedule of Events**

| | |
|---|---|
| **12:00 (noon)** | ***PLENARY Session[1]*** |
| | |
| **BI Auditorium** | **Welcome and Introduction of Keynote Speaker by Phi Zeta President**, **Dr. Nicolette Cassel**<br>***Keynote Speaker* Dr. Ken Burton**<br>"Life is a Highway – Explore the Scenic Route" |
| | |
| **1:15 – 2:30 pm** | ***ORAL Research Presentations[2]*** |
| | |
| **BI Auditorium** | **Applied/Clinical Science Research (Large Animal)** |
| **201 Trotter Hall** | **Applied/Clinical Science Research (Companion Animals/exotics)** |
| **301 Trotter Hall** | **Basic Science Research & Case Reports (Large animal)** |
| | |
| **2:30 – 3:30 pm** | ***Royal Canin POSTER Session*** |
| | |
| **BI Atrium** | **Basic Science Research / Applied/Clinical Science Research / Case Reports** |
| | |
| **3:30 – 4:30 pm** | ***ORAL Research Presentations[2]*** |
| | |
| **BI Auditorium** | **Applied/Clinical Science Research (Large Animal)** |
| **201 Trotter Hall** | **Applied/Clinical Science Research (Companion animals/exotics)** |
| | |
| **4:30-5:30 pm** | |
| **BI Atrium** | *Reception* |
| **5:30 pm** | |
| **BI Auditorium** | ***AWARDS Ceremony[3]*** |
| | **Initiation of New Members to Phi Zeta**<br>**Announcement and Presentation of Awards Recognizing Research and Scholarship Accomplishments**<br>**Closing Comments** |

[1] The plenary session (welcome and keynote) will be held in the BI Auditorium – Buffet lunch will be available to those who RSVP
[2] Presenters should arrive no later than 1:00 pm to their designated room to upload their presentations. Presentations should be 12-minutes and allow 3 minutes for questions and answers.
[3] We invite all attendees to RSVP join us for the Award ceremony at the BI auditorium.

# Applied/Clinical Science ORAL PRESENTATIONS
## LARGE ANIMALS

**March 11, 2025, 1:15 – 4:15 pm**
**BI Auditorium**

| Time | Presenter | Title |
|---|---|---|
| 1:15 – 1:30 | Maddie Mancke <br> Pg 33 | The use of Lidocaine-infused castration bands to castrate beef-dairy calves and its effect on animal welfare and performance |
| 1:30 – 1:45 | Rebecca Bigelow <br> Pg 12 | Management practices of pre-weaned beef-on-dairy calves on commercial calf ranches |
| 1:45 – 2:00 | Hari Balaji Sridhar <br> Pg 42 | Prevalence of Salmonella enterica in feces of beef-on-dairy cattle: Investigating management factors in calves and growers |
| 2:00 – 2:15 | Sri Nithya <br> Pg 18 | Antimicrobial resistance profiles of Mannheimia haemolytica and Pasteurella multocida: Review of Kansas State Veterinary Diagnostic Laboratory data from 2010 to 2024 |
| 2:15 – 2:30 | Laura Carpenter <br> Pg 15 | Association of abnormal heart scores with gross lung diagnoses and other associated factors |
| 2:30 – 3:30 | **Break for Poster Session**[1] | |
| 3:30 – 3:45 | Jacob Schumacher <br> Pg 41 | Evaluation of ClipFitter as a Novel Method of Castration for Calves |
| 3:45 – 4:00 | Jordana Zimmerman <br> Pg 51 | Automated Machine Learning and Facial Imaging for Feedyard Cattle Outcome Prediction |
| 4:00 – 4:15 | Jessica Carnal <br> Pg 14 | Evaluating the efficacy of oral firocoxib to alleviate post-farrowing pain in sows |

[1] Poster presentations will be held at the **Atrium of the BI Auditorium**

## Applied/Clinical Science ORAL PRESENTATIONS
## COMPANION ANIMAL AND EXOTICS

**March 11, 2025, 1:15 – 4:15 pm**
**TROTTER 201**

| | | |
|---|---|---|
| 1:15 – 1:30 | Abi Huber <br> Pg 25 | Effect of Ehmer sling on hip joint and evaluation of efficacy and tolerability of DogLeggs® Ehmer sling with vest |
| 1:30 – 1:45 | Ashley Bowyer <br> Pg 13 | Pharmacokinetics and adverse effects of voriconazole administered orally every 72 hours to healthy cats |
| 1:45 – 2:00 | Briana Raya <br> Pg 39 | First Detection of Echinococcus Multilocularis in Wild Canids in Kansas and Missouri |
| 2:00 – 2:15 | Amanda Roth <br> Pg 40 | Hookworm Benzimidazole Resistance Allele Occurrence in Kansas Dogs |
| 2:15 – 2:30 | Darby Toth <br> Pg 44 | Use of abdominal ultrasound in patient selection for laparoscopic-assisted gastrointestinal foreign body removal |
| 2:30 – 3:30 | **Break for Poster Session**[1] | |
| 3:30 – 3:45 | Ilya Verekham <br> Pg 46 | Haemosporidian Parasites in Kansas Birds and an Investigation into the Biting Midge Vector |
| 3:45 – 4:00 | Kalie Fikse <br> Pg 22 | Imaging Diagnosis: Atypical CT Appearance of a Multilobular Osteochondrosarcoma in a Dog |
| 4:00 – 4:15 | Cheyenne Town <br> Pg 45 | Are you bothered? Using accelerometers for measuring fly worry in horses |

[1] Poster presentations will be held at the **Atrium of the BI Auditorium**

# Basic Science ORAL PRESENTATIONS

**March 11, 2025, 1:15 – 4:15 pm**
**TROTTER 301**

| | | |
|---|---|---|
| 1:15 – 1:30 | Brigette King<br>Pg 28 | STAR-Trax – Tracking the Lone Star tick's seasonality and impact |
| 1:30 – 1:45 | Lillian Novotny<br>Pg 36 | Markers of bacterial translocation and systemic inflammation in dogs with myxomatous mitral valve disease |
| 1:45 – 2:00 | Saurav Pantha<br>Pg 38 | Females With Obesity Suffer from More Severe Disease Following Influenza A Virus Infection |
| 2:00 – 2:15 | Brian Wolfe<br>Pg 47 | Sex Differences in Influenza Vaccine-Induced Immunity and Protection in Mice with Obesity |
| 2:15 – 2:30 | Alexandria Zabiegala<br>Pg 49 | Roles of PD-L1 in the pathogenicity of feline infectious peritonitis virus |
| 2:30 – 3:30 | **Break for Poster Session**[1] | |

[1] Poster presentations will be held at the **Atrium of the BI Auditorium**

## Applied/Clinical Science POSTERS

**March 11, 2025, 2:30 – 3:30**
**BI Atrium**
(Posting from 1:00 – 4:30 pm; Q&A for Judging 2:30 – 3:30 pm)

| | | |
|---|---|---|
| 1 | Alyssa Hobbs Pg 24 | Behaviors of beef-dairy calves that received a dose of maternal bovine appeasing substance (MBAS) at weaning |
| 2 | Bryce Gabbard Pg 23 | Development of an artificial feeding system to rear cat fleas (Ctenocephalides felis) |
| 3 | Lauryn Mauler Pg 34 | Do swine farms have a mosquito problem? |
| 4 | Danqin Li Pg 31 | Could viral vaccines be used as alternatives for antimicrobials? Insights from U.S. swine veterinarians |
| 5 | Jimena Kilian Pg 29 | Fluoroquinolones are a risk factor for cranial cruciate ligament ruptures in Retrievers |
| 6 | Cheyla Myrick Pg 35 | Detection of Environmental Pollutants in Canine Tissues |
| 7 | Haitham Alneaemy Pg 11 | Prevalence of Major Bacterial Pathogens in Liver Abscesses of Beef-on-Dairy cattle |
| 8 | Kaitlin Colle Pg 17 | Development of Disc Diffusion Interpretive Criteria for CLSI Generic Veterinary Breakpoints |
| 9 | Eric Cheng Pg 16 | Seroprevalence in Beef Cattle Against Coxiella Burnetii Infection |
| 10 | Stephen Edache Pg 20 | Investigating mosquito abundance and diversity on US commercial swine farms |

**Basic Science POSTERS**

**March 11, 2025, 2:30 – 3:30 pm**
**BI Atrium**
(Posting from 1:00 – 4:30 pm; Q&A for Judging 2:30 – 3:30 pm)

| | | |
|---|---|---|
| 1 | Ivy Elkins (Schmid)<br>Pg 21 | Evaluation of efficiency and sustainability of cows with diverse genetics and varying forage availability. |
| 2 | Kate Lewis<br>Pg 30 | BriteVu vs Omnipaque: Computed topography imaging of hedgehog (Atelerix albiventris) vasculature |
| 3 | Dylan Wootton<br>Pg 48 | Baculovirus expression of the VP-2 protein from epizootic hemorrhagic disease virus serotype 8 |
| 4 | Qi Zhang<br>Pg 50 | Comparative Analysis of Proinflammatory Cytokines and Chemokines in Different Tissues following Influenza Infection in a Mouse Model of Obesity |
| 5 | Surya Prasad Devkota<br>Pg 19 | Role of sympathetic neuron signaling in modulating pulmonary fibrosis |
| 6 | Prabhu Joshi<br>Pg 26 | Role of Beta-2 Adrenergic Receptor Signaling in Innate Immunity Against Intracellular Bacterial Pathogen |
| 7 | Sujan Kafle<br>Pg 27 | Single-Cell Analysis of Host Responses in Bovine Milk Somatic Cells (bMSCs) Following HPAIV bovine-H5N1 Influenza Infection. |
| 8 | Sandeep Adhikari<br>Pg 8 | β2-Adrenergic signaling enhances anti-inflammatory response and viral clearance during neonatal Respiratory Syncytial Virus infection |
| 9 | Ashlie Ake<br>Pg 9 | Mosquito Surveillance in Suburban Greenspaces |
| 10 | Camila I. Amrein Almira<br>Pg 10 | Activity of 3C-like Protease Inhibitors Against Bat Coronaviruses of Pandemic Potential |
| 11 | Chinemerem Onah<br>Pg 37 | Nociceptor Sensory Neurons Augment Antifungal Immunity during Lethal Aspergillus fumigatus Pneumonia |

**PHI ZETA OFFICERS 2025**

On behalf of the Phi Zeta Executive Committee (2025)

Dr. Nicolette Cassel – President (ncassel@vet.k-state.edu)
Lauryn Clifton Class of 2025 – Vice President (clifton3@vet.k-state.edu)
Dr. Santosh Dhakal– Secretary (sdhakal3@vet.k-state.edu)
Dr. Pradeep Malreddy – Treasurer (pmalredd@vet.k-state.edu)
Dr. Raghavendra Amachawadi – Past President (agraghav@vet.k-state.edu)
Anna Harris – Alumni Affairs & Events (annak27@vet.k-state.edu)

**Presenter:** Sandeep Adhikari

**Title:** β2-Adrenergic Signaling Enhances Anti-Inflammatory Response and Viral Clearance During Neonatal Respiratory Syncytial Virus infection

**Authors:** Sandeep Adhikari, MS, Pankaj Baral[1]*, MSc, PhD

**Affiliations:**
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**Corresponding Author:** Pankaj Baral[1], baral@vet.k-state.edu

**Keywords:** Respiratory Syncytial Virus; β2-Adrenergic; Neonate; Albuterol

## Abstract

Respiratory syncytial virus (RSV) is the leading cause of acute bronchiolitis and pneumonia in children globally. RSV infection is characterized by mild symptoms like wheezing, cough, sneezing caused by lung inflammation and viral amplification. The crosstalk between neurons and immune and non-immune cells develops early life onwards. The lungs and airways are densely innervated by sympathetic neurons that secrete the neurotransmitter noradrenaline (NA) at homeostasis and following injury in adult mice. However, it is unknown whether sympathetic neurons regulate anti-viral immunity in neonates and early life infection. NA, once secreted into the lungs, can act on immune and non-immune cells through β-adrenergic receptors (β-ARs). In a mouse model of neonatal RSV infection, we find that that stimulation of adrenergic signaling via the β2-AR agonist (Albuterol) robustly increases viral clearance, anti-inflammatory responses leading to recovery from the infection. By contrast, loss of sympathetic neurons and the β2-AR increases the RSV load in neonatal mice. β2-AR signaling had downstream effect of reduced airway mucus secretion which prevented respiratory failure, airway blockade and facilitate control of RSV infection. Collectively, our studies show that sympathetic neurons and β2-AR signaling protect neonates from viral expansion and inflammation to promote antiviral defense.
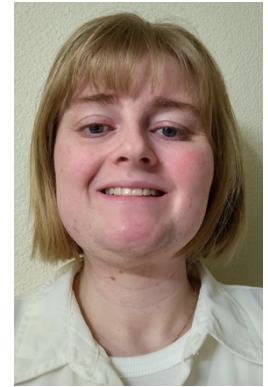
**Presenter:** Ashlie Ake

**Title:** Mosquito Surveillance in Suburban Greenspaces

**Authors:** Ashlie Ake[1], Samantha Schwindt[2], Nicole Ioerger [1, 3] MS, Nicole Ostrander1, Audrey Matheny[1] PhD, Susan Hettenbach [4] BS , Dana Vanlandingham[1]*, PhD

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**Corresponding Author:** Dana Vanlandingham[6], PhD, MS,BS dlvanlan@bri.ksu.edu

**Keywords:** Mosquito; Suburban; Culex; Surveillance

## Abstract

Mosquitoes are an established vector of many pathogens that affect human and animal health. One of the arboviruses that impacts both animal, primarily horses, and human health significantly in the United States is West Nile virus (WNV), which is present in Kansas. There are many native Kansas mosquitoes in the genus Culex that can transmit WNV, including Culex pipiens and Culex quinquefasciatus. These two very closely related mosquito species are effective at transmitting WNV because they are opportunistic feeders willing to take a blood meal from both avian and mammalian hosts. Historically, mosquito surveillance in Kansas has been sporadic, and these surveys do not mention the environment where the mosquitoes are collected. The two aims of this study are to identify which mosquito species are present in suburban backyards in Kansas and to show how locations which appear environmentally similar can have differences in mosquito species prevalence which could be relevant to future public health initiatives. The method for mosquito collection utilized CDC light traps baited with $CO_2$, placed once per week in the evening and then collected the following morning. Collection occurred from June 4 to July 23, 2024, in three suburban locations in Manhattan, KS. Each location was a privately owned suburban home with greenspace near slowly running water, one of the locations had a small backyard chicken coop. All female mosquitoes were identified to species using a physical characteristics dichotomous key; due to limitations of this key Culex pipiens and Culex quinquefasciatus were reported together. The three most common mosquito species collected over this eight-week period were Aedes vexans (747, 63%), Aedes albopictus (78, 8%), and Culex pipiens/quinquefasciatus (89, 7%). Aedes vexans and Culex pipiens/quinquefasciatus were detected every trapping day over the summer for 2024, whereas Aedes albopictus was detected with increasing frequency throughout the collection period. The collection location with chickens present had a statistically significant increase in the number of Aedes vexans and Culex pipiens/quinquefasciatus collected than both of the other locations. In future studies, it would be beneficial to collect mosquitoes for longer periods and at more locations. This collection began in June and while Aedes albopictus was not collected on the first day it is impossible to know if this was because they had not emerged yet for the summer or if the day was just not a good day for collecting them, had the collection started earlier it might be possible to determine this. Trapping at more locations would broaden the scientific understanding of which mosquitoes are present in Kansas and when they are most abundant, leading to an improved understanding of what precautions should be taken to protect from arboviruses.

**Presenter:** Camila I. Amrein Almira

**Title:** Activity of 3C-like Protease Inhibitors Against Bat Coronaviruses of Pandemic Potential

**Authors:** Camila I. Amrein Almira[1], BS, David George[1], MS, Kyeong-Ok Chang[1], DVM, PhD, Yunjeong Kim[1]*, DVM, PhD, DACVM, William Groutas[2], PhD

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**Keywords:** Coronavirus; 3CLpro; Bats

## Abstract

Introduction: Bats are considered the major natural reservoir of coronaviruses. Some sarbecoviruses (SARS-CoV-2-like viruses) and merbecoviruses (MERS-CoV-like viruses) in the Betacoronavirus genus are at a greater risk of spillover as they are reported to use ACE2 or DPP4, known receptors for SARS-CoV-2 and MERS-CoV, respectively. Therefore, it is important to understand whether antiviral drugs are active against bat coronaviruses with increased zoonotic risk. Methods: In this study, we determined the activity of our 3C-like protease (3CLpro) inhibitor GC376, developed for feline infectious peritonitis virus (FIPV), its three derivatives, and nirmatrelvir (COVID-19 drug) against 3CLpros of FIPV, SARS-CoV-2, MERS-CoV and three bat coronaviruses using human ACE2 or DPP4. The objective was to determine the effectiveness of these compounds against bat coronaviruses of high risk of spillover. First, 3CLpro homology analysis was conducted. Each compound was tested for activity using the Fluorescence Resonance Energy Transfer assay to determine the 50% inhibitory concentration. The anti-FIPV activity of two compounds was also tested in cell culture, and the 50% effective concentration was calculated. Results: We found that all tested compounds showed potent activity against FIPV, SARS-CoV-2 and MERS-CoV and moderate activity against the bat coronaviruses. In cell culture, compound GC1049 inhibited the replication of FIPV more potently than nirmatrelvir. Interestingly, antiviral activities did not correlate well with 3CLpro sequence homology, suggesting that differences in the 3CLpro binding pocket is likely a determinant in potency. Conclusion: These results emphasize the need for the development of broad-spectrum antivirals to prepare for future coronavirus pandemics.
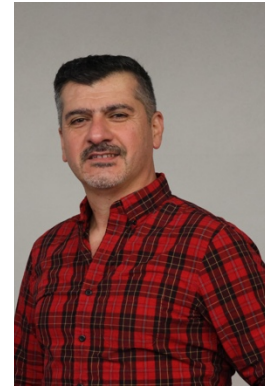
**Presenter:** Haitham Alneaemy

**Title:** Prevalence of Major Bacterial Pathogens in Liver Abscesses of Beef-on-Dairy Cattle

**Authors:** Haitham Alneaemy[1], BVM, MSc, Raghavendra G. Amachawadi[1*], BVSc, MS, PhD, Haiyan Wang[2], PhD, Harith Salih[1], BVM, MS, Taghreed Mahmood[1], BVM, Phillip Lancaster[1], PhD, Reese Wilson[3], BS, MS, Dale Woerner[3], PhD, T. G. Nagaraja[4], BVSc, MVSc, PhD

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**Keywords:** Liver abscess; Beef-on-Dairy cattle; Major bacterial pathogens

## Abstract

Liver abscesses are a major economic issue for the U.S. beef industry, comprising 67% of liver abnormalities in slaughtered cattle. The prevalence ranges from 10- 20%, potentially reducing carcass value by up to $38 per animal with the most sever abscesses. The causative agents, believed to originate from the rumen, include two subspecies of Fusobacterium necrophorum, (necrophorum and funduliforme), Trueperella pyogenes and Salmonella enterica. The use of beef cattle semen to breed dairy cows for beef-on-dairy crosses has surged in the past five years, boosting calf value but facing challenges like high liver abscess incidence and economic losses. The incidence is reported to be 2 to 3 times higher than the conventional feedlot cattle. The reason for the high incidence is not known. Our objectives were to determine the prevalence and distribution of major bacterial pathogens associated with liver abscesses in beef on dairy cattle. Liver abscesses (n=237) of beef-on-dairy cattle, originating from 5 feedlots, were collected at slaughter. An abscess with an intact capsule and inflammatory zone was selected for processing. Samples were subjected to anaerobic and aerobic bacterial isolations utilizing enrichment and selective media. All statistical analyses were performed using R version 4.3.1. Contingency tables were constructed to summarize the counts of bacterial pathogens by liver score and sex. Fisher's exact test was applied to these tables to assess the independence of each pathogen with respect to liver score and sex. To further investigate pathogen prevalence, logistic mixed-effects models were fitted for each bacterial species, incorporating liver score, sex, and their interaction as fixed effects, with a random intercept for Lot. The p-value was considered significant at the 0.05 level. Overall, prevalence of subsp. necrophorum, subsp. funduliforme, T. pyogenes and S. enterica in liver abscesses were 84% (199/237), 19% (45/237), 27% (64/237) and 4.6% (11/237), respectively. Twenty-three (9.7%) samples were positive for both subsp. necrophorum and subsp. funduliforme. Thirteen samples (5.5%) were positive for subsp. necrophorum, subsp. funduliforme, and T. pyogenes. F. necrophorum prevalence strongly correlated with liver score. Sex and liver score significantly impacted the prevalence of F. funduliforme and T. pyogenes. The prevalence of F. necrophorum is highly associated with the liver score (p &lt; 0.0001). There is no evidence to suggest that the liver score is related to the prevalence of the other three pathogens. Both, sex and liver score had a significant interaction on the prevalence of F. funduliforme (p = 0.0003) and T. pyogenes (p = 0.0135). The odds of F. necrophorum prevalence is similar between Heifer and Steer and much higher than other three pathogens in animals with liver abscess. The odds of F. funduliforme prevalence did not differ significantly between heifers and steers in animals with liver abscess. The odds of T. pyogenes prevalence were higher in Steers with liver scores A- or A when compared to Heifers. For A+ liver score, the odds did not differ between Heifers and Steers. Efforts are directed towards evaluating the relationship between feeding and management practices and liver abscess development to identify intervention strategies.

**Presenter:** Rebecca Bigelow

**Title:** Management Practices of Pre-Weaned Beef-on-Dairy Calves on Commercial Calf Ranches

**Authors:** Rebecca A. Bigelow[1] MS, Phillip A. Lancaster[1], PhD*, Brad J. White[1], DVM, MS, Tera R. Barnhardt[3], DVM, MS, Miles E. Theurer, DVM, PhD

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**Corresponding Author:** Phillip A. Lancaster, PhD, palancaster@vet.k-state.edu

**Keywords:** Survey; calf weaning; calf raising; calf starter feed; milk feeding protocol

## Abstract

Background The number of beef-on-dairy calves being produced has been steadily increasing. Many calves are sent off-site to calf ranches for raising soon after birth. Multiple surveys have been conducted on management of replacement dairy heifers. The objective of this survey was to describe management practices of beef-on-dairy calves in commercial calf ranches. Methods A total of 15 calf ranches were surveyed in 3 regions: the high plains, midwest, and west. Surveys were conducted in-person (n = 13) or via video call (n = 2) between November 2023 and June 2024. Frequencies of participants' answers were calculated as a percentage of operations for each question to describe the management practices used. Results The capacity of the operation was categorized as less than 1,000, between 1,000 and 50,000, and greater than 50,000 calves. All operations received calves less than 4 days of age. There was a variety of types of pre-weaning housing. All operations fed milk twice per day upon arrival, however the amount of milk fed varied between 2 (60%) and 3 (40%) quarts among operations. Approximately 87% of operations gradually weaned calves off milk. Every operation offered calf starter upon arrival, but formulation of starter diets differed among ranches. Weaning age ranged between 42 and 72 days with about 53% of operations weaning calves at 60 days or greater. All operations administered at least 2 health products such as vaccines, antimicrobials, etc. to pre-weaned calves. Conclusions These results provide important information regarding the management of beef-on-dairy calves at commercial calf ranches.

**Presenter:** Ashley Bowyer

**Title:** Pharmacokinetics and Adverse Effects of Voriconazole Administered Orally Every 72 Hours to Healthy Cats

**Authors:** Ashley Bowyer[1]*, DVM, Butch KuKanich[2], DVM, PhD, DACVCP, Amy Rankin[1], DVM, MS, DACVO, Kate KuKanich[1], DVM, PhD, DACVIM, Jessica Meekins[1], DVM, DACVO, Mark Papich[3], DVM, MS, DACVCP

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**Corresponding Author:** Ashley Bowyer[1]*, DVM, abowyer@vet.k-state.edu

**Keywords:** voriconazole; oral administration; pharmacokinetics; cats; adverse effects

## Abstract

Introduction: Some cats with systemic fungal disease fail to respond to itraconazole and fluconazole, thus this study aimed to investigate pharmacokinetics and adverse effects of voriconazole in cats with an extended dosing protocol. Methods: Nine healthy cats were administered voriconazole at a loading dose of 25 mg/cat PO followed by 12.5 mg/cat PO every 72 hours for 16 days. Plasma voriconazole concentration was measured: 4, 8, and 12 hours after voriconazole administration on days 1 and 16; on days 4, 7, 10, 13, and 16 before drug administration; and every 48 hours for 6 days after the last dose. Pre- and post-treatment physical examination, electroretinography (ERG), electrocardiography (ECG), complete blood count, serum chemistry, and urinalysis were performed. Results: Plasma trough concentration 72 hours after the first dose was 1.80 +/- 0.48 µg/mL, increasing to 4.53 +/- 1.05 µg/mL immediately prior to the last dose ($p < .001$). Half-life also significantly increased from day 1 (5.5 +/- 1.4 days) to day 15 (11.9 +/- 5.2 days) ($p = .001$), which is much longer than previously reported. Adverse effects included weight loss (mean = 0.24 kg in 8/9 cats), vomiting (4/9), and sporadic miosis (3/9). The mean ERG b-wave decreased from 317 to 213 µV with treatment ($p < .001$). No visual deficits were appreciated. Conclusions: Voriconazole had a long half-life and continued accumulation in cats when administered orally at 72-hours intervals. Further research is needed to determine the optimum dosage and whether decreased ERG b-wave is a clinically significant effects.

**Presenter:** Jessica Carnal

**Title:** Evaluating the Efficacy of Oral Firocoxib to Alleviate Post-Farrowing Pain in Sows

**Authors:** Jessica Carnal[1]; Abbie V. Viscardi[2*], PhD

**Affiliations:**
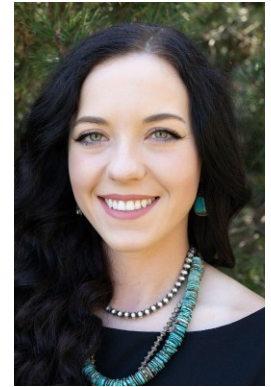[1]Kansas State University College of Veterinary Medicine, Class of 2027, Manhattan, Kansas, USA
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**Corresponding Author:** Abbie V. Viscardi[1], PhD, aviscardi@vet.k-state.edu

**Keywords:** welfare; sows; farrowing; pain management

## Abstract

In the United States, millions of sows farrow each year without pain management, even though parturition is known to be painful. Unmanaged pain negatively impacts the sow's welfare and can lead to economic and production losses. A previous study found transmammary delivery of firocoxib (FIRO) to piglets provided some pain relief during castration and tail docking. Since the sows received firocoxib orally for the transmammary delivery to the piglets, we hypothesized that it might also alleviate post-farrowing pain. Forty-five sows (Yorkshire x Landrace) that were 2 days post-farrowing were enrolled in this study and randomly allocated to one of three treatment groups (n=15 sows/treatment): oral placebo, mid-level dose of oral FIRO (3.0 mg/kg), or high-level dose of oral FIRO (5.0 mg/kg). The outcome variables assessed were behavior, facial grimacing, infrared thermography (IRT) of the vulva and cranium, pressure mat gait analysis, plasma cortisol concentrations, plasma drug concentration, and body weight. Plasma cortisol concentrations and IRT were taken at baseline, 4, 8, 12, 24, 36, and 48h post-treatment. Sow body weight was collected at baseline and at the time of piglet weaning (21 days post-farrowing) for average daily gain (ADG) calculation. Cortisol levels were significantly higher in all treatment groups at baseline when compared to the other time points ($p \leq 0.05$). Placebo sows had significantly lower vulva temperatures when compared to 3.0mg/kg ($p=0.02$) and 5.0 mg/kg ($p=0.04$) FIRO groups. No significant differences in ADG were found between treatment groups; however, placebo sows, on average, lost weight (-0.09lb/day) while sows administered 5.0 mg/kg FIRO gained weight (0.4lb/day). These preliminary results suggest that firocoxib administration may benefit sows by reducing stress after farrowing. Further outcome analysis will be done to confirm these preliminary results.

**Presenter:** Laura Carpenter

**Title:** Association of abnormal heart scores with gross lung diagnoses and other associated factors

**Authors:** Laura Carpenter[1], Todd Gunderson[2]*, DVM, MS, Brad White[2], DVM, MS, Robert Larson[2], DVM, PhD

**Affiliations:**
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**Corresponding Author:** Todd Gunderson[2], DVM, MS, tggundy@vet.k-state.edu

**Keywords:** feedlot; cattle; AIP; heart score

## Abstract

Background: Congestive heart failure, bovine respiratory disease and interstitial pneumonia are important syndromes in feedlot cattle, but little research has been done evaluating a relationship among these cardiopulmonary pathologies. Methods: Across 8 Kansas feedlots, 925 necropsies were performed on mortalities in the summers of 2023 and 2024. Heart scores were assigned on a 1-5 scale during necropsy. For this study, a score of 1, 2, or 3 were considered normal heart scores (NHS), while a score of 4 or 5 were considered abnormal heart scores (AHS). Gross lung diagnoses were determined during necropsy and confirmed by a licensed veterinarian. Diagnoses included were: normal (WNL), bronchopneumonia (BP), bronchopneumonia with interstitial pattern (BIP), and acute interstitial pneumonia (AIP). A generalized linear mixed model was built using manual forward selection, with AHS as the binomial outcome variable, and lung diagnoses and demographic information as explanatory variables. Results: Of the 925 total mortalities, 817 were included in data analysis. Explanatory variables in the final model were gross lung diagnosis and days from shipping (DFS) ($P < 0.05$). Mortalities with AIP had a greater probability of an AHS (33%), compared to BP (16%) and WNL (7%). Additionally, mortalities with ≤50 DFS had a higher probability of an AHS (30%) compared to those with >50 DFS (9%). Conclusions: This study indicates that the probability of an AHS varies with lung pathology and suggests interstitial pneumonia and cardiac remodeling are associated in feedlot mortalities. Also, an AHS is more likely in cattle that die later in the feeding period.
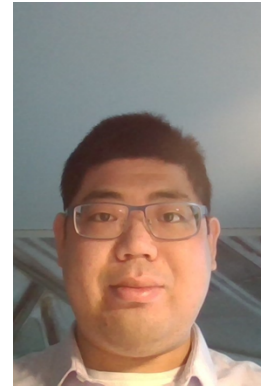
**Presenter:** Eric Austin Cheng

**Title:** Seroprevalence in Beef Cattle Against Coxiella Burnetii Infection

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**Keywords:** Coxiella Burnetii, Q Fever, Animal Health, Beef Cattle, Seroprevalence

## Abstract

Introduction: Coxiella burnetii causes Q fever, a worldwide zoonotic disease. This disease is common among cattle, sheep, goats, and swine. Since 1999, Q fever has been considered as a reportable disease in the U.S., due to its threat to food safety and public health. Coxiella burnetii has been identified in a large percentage of dairy farms, however its prevalence in beef cattle herds has not been reported. The objective of this study was to identify the potential presence of the bacterium by qPCR, and compare with antibody response tested by Q-fever ELISA using paired blood and serum samples. Method: A collection of 567 paired blood and serum samples and an additional 562 serum samples were used for the study. Animal age, breed, and bovine leukemia (BLV) status were recorded at sample collection. Whole blood samples were subjected to DNA extraction and qPCR identification using the KSVDL C. burnetii assay. Serum samples were processed and tested with a commercial antibody ELISA kit against C. burnetii infections. Result: All 567 blood samples were negative by the qPCR test. ELISA test was performed on 1129 serum samples, and the overall positive rate was 15.4%. Descriptive statistical analysis on different cattle breeds indicated that the animal breed with the highest seroprevalence was Angus cross breed (23.4%), followed by Simmental-Angus cross (19.7%), Hereford (18.9%), Angus (17.7%) and Hereford-Angus cross (10.7%). The lowest positive rate was found in Red Angus cattle (4.3%). Animal age analysis observed that the lowest seroprevalence was found in 2.5 years and 3 years-old cattle with 5.1% and 8.3% positive rate, respectively. An 8.5% positive rate was found in under 4 years of age, 25% in 4-6 years, 19% in 7-9 years, and 15.3% found in older than 9 years of cattle. A higher C. burnetii positive rate was identified in animals that were also positive to bovine leukemia virus (BLV) (18.8% vs. 13.7%). Conclusion: Although all blood samples were PCR negative for C. burnetii, a relatively high antibody positive rate (15.4%) was observed using a commercial ELISA kit. Those that were positive for BLV had higher C. burnetii antibody positives (18.8%) than those that were negative for BLV (13.7%). Only 2.5 and 3 years-old animals had lower ELISA positive rates, and animals younger or older than this age group both had higher positive rates indicating animal age may not be an influential factor.

**Presenter:** Kaitlin Colle

**Title:** Development of Disc Diffusion Interpretive Criteria for CLSI Generic Veterinary Breakpoints

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**Keywords:** Antimicrobial; Disk Diffusion

## Abstract

Antimicrobials are used to protect animal health when bacterial infections occur, such as bovine respiratory disease caused by Mannheimia haemolytica and Pasteurella multocida. Antimicrobial susceptibility testing (AST) breakpoints aid veterinarians in selecting the most appropriate antimicrobial while minimizing selection for antimicrobial resistance. The Clinical and Laboratory Standards Institute (CLSI) has been developing AST breakpoints for over 30 years; however, many important antimicrobial-pathogen combinations still lack breakpoints, or lack Zone Diameter (ZD) breakpoints to accompany the initial Minimum Inhibitory Concentration (MIC) breakpoints. This research is part of a multi-site study to generate MIC - ZD correlations to support the development of disk diffusion breakpoints for M. haemolytica and P. multocida for ampicillin, penicillin and tetracycline. Twenty unrelated clinical isolates of each bacterial species were tested by both broth microdilution and disk diffusion AST methods according to CLSI standards to obtain the MIC and ZD, respectively. These data were combined with results from collaborating study sites. Using the error-rate bounding method to compare the zone diameters against established MIC breakpoints, M. haemolytica Susceptible (S) and Resistant (R) ZD breakpoints (in mm) for cattle were presented to and voted on by the CLSI subcommittee to be: ampicillin: indeterminable; penicillin: indeterminable; and tetracycline: S ≥ 23, R ≤ 19. The ZD breakpoints for P. multocida were: ampicillin: indeterminable; penicillin: S ≥ 25, R ≤ 18; tetracycline: S ≥ 22, R ≤ 17. These data were also used to support the following ZD breakpoints for swine and cats for P. multocida, ampicillin: S ≥ 25, R ≤ 18. Additional swine breakpoints were voted on for P. multocida as: penicillin: S ≥ 25, R ≤ 18; and tetracycline: S ≥ 23, R ≤ 18. These data will contribute to the development of CLSI disk diffusion breakpoints for ampicillin, penicillin and tetracycline for M. haemolytica and P. multocida for cattle and expanded to include swine and cats P. multocida breakpoints as well.

**Presenter:** Sri Nithya Dasari

**Title:** Antimicrobial Resistance Profiles of *Mannheimia Haemolytica* and *Pasteurella multocida*: Review of Kansas State Veterinary Diagnostic Laboratory Data From 2010 to 2024

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**Keywords:** Bovine Respiratory Disease; Antimicrobial Resistance; *Mannheimia haemolytica*, *Pasteurella multocida*; Passive surveillance

## Abstract

Antimicrobial resistance (AMR) is a significant global public health threat. A major driver of antimicrobial use in feedlot cattle is bovine respiratory disease (BRD), a complex, multifactorial and economically important disease of feedlot cattle. A number of medically important antibiotics are widely used in the treatment and prevention of BRD in cattle. Therefore, BRD treatment and control are a major concern for emergence and dissemination of AMR for medically important antimicrobials. Passive surveillance through veterinary diagnostic laboratories, especially among BRD causing major bacteria pathogens (*Mannheimia hemolytica* and *Pasteurella multocida*), is essential to build a comprehensive AMR surveillance program that will support veterinarians with critical information that guides treatment decisions and addresses the growing challenge of AMR. Our objectives were to describe the prevalence and trends in AMR for major BRD bacterial pathogens isolated from nasal swabs and lung samples. Antimicrobial suceptibility test results and associated metadata for BRD pathogens were extracted from Kansas State Veterinary Diagnostic Laboratory (KSVDL) records from April 2010 to June 2024. The bacterial isolates were categorised as "susceptible" (S), "intermediate" (I), or "resistant" (R) using the breakpoints from Clinical and Laboratory Standards Institute (CLSI) and the European Committee on Antimicrobial Suceptibility Testing (EUCAST). To ensure a conservative assessment of resistance profiles and to account for potential therapeutic challenges, isolates initially classified as "Intermediate (I) were reclassified as "Resistant" (R), and isolates with "N" (No Breakpoint Available) and "NI" (No Interpretation) were excluded from the analysis. All the data analyses (descriptive and inferential) were performed using R software (v. 2024.09.0+375). A total of 2,360 *M. haemolytica* [64.6%: lung (2,028) and nasal (332)], and 1,291 *P. multocida* [35.4%: lung (906) and nasal (385)] isolateswere included in the analysis. From 2010-2024, *M. haemolytica* showed higher resistance to tetracycline, gamithromycin, and tilmicosin. *P. multocida* showed lower resistance than *M. haemolytica,* with gradual increase in tetracycline and tilmicosin resistance. Gamithromycin and tildipirosin resistance increased post-2018, while florfenicol resistane surged after 2022. Ceftiofur resistance is low in both *M. haemolytica* and *P. multocida*. Increasing resistance trends to fluoroquinolones (enrofloxacin and danofloxacin), has been reported for both pathogens. *M. haemolytica* exhibited higher resistance than *P. multocida* across most antimicrobials, with lung isolates showing greater resistance than nasal isolates for both pathogens ($p < 0.05$). Statistically significant differences between lung and nasal isolates were observed for *M. haemolytica* (Ampicillin, Danofloxacin, Enrofloxacin, Florfenicol, Gentamicin, Penicillin, Spectinomycin, Tetracycline, Tildipirosin, Tilmicosin, Tulathromycin) and *P. multocida* (Ampicillin, Gentamicin, Spectinomycin, Tetracycline, Tulathromycin). The multidrug resistant (MDR) trend shows a biphasic pattern with initial high prevalence, a steady decline, followed by a rise for both bacteria. Future studies are directed towards studying temporal trends and their association with the prevalence of MDR isolates in both lung and nasal samples. Comparative analysis, antimicrobial resistance profiling and survival analysis will be integral to understanding the dynamics of MDR in BRD pathogens. To reduce AMR in livestock and safeguard public health, ongoing AMR surveillance, supported by continuous monitoring, data-driven policies and collaboration across sectors is essential.

*March 11, 2025*

**Presenter:** Surya Prasad Devkota

**Title:** Role of Sympathetic Neuron Signaling in Modulating Pulmonary Fibrosis

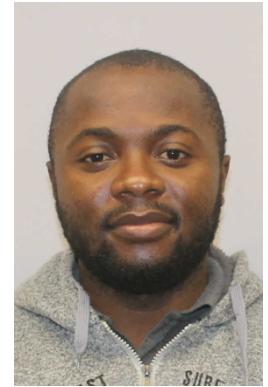**Authors:** Surya Prasad Devkota[1*],MS, Pankaj Baral[1*], PhD

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**Keywords:** Pulmonary fibrosis; sympathetic neuron; neuroimmune interaction

## Abstract

Pulmonary fibrosis is a chronic and fatal lung disease caused by excessive accumulation of collagen and other extracellular matrixes. Survival after diagnosis is around 3-5 years on average and there are only a few supportive treatments available but no cure yet. Hence, there is an imminent need to search for possible treatment options for this deadly disease. Sympathetic neurons highly innervate the respiratory tract and are known to modulate lung inflammation by communicating with various immune cells. However, the role of such neuroimmune interaction during pulmonary fibrosis is unknown. Our research aims to analyze the role of sympathetic neurons in the modulation of pulmonary fibrosis and ultimately to explore neuroimmune mechanisms that can be implemented as a possible therapeutic option. Our preliminary data shows that sympathetic neurons play a role in modulating pulmonary fibrosis as indicated by significantly reduced weight loss in sympathetic neurons ablated fibrotic mice. We also observed less pulmonary fibrosis as indicated by less collagen deposition in neuron-ablated mice compared to the control group. Similarly, various inflammatory and profibrotic marker gene expressions were also downregulated in neuron-ablated mice. Interstitial macrophages, key immune cells involved in pulmonary fibrosis, were also reduced in neuron-ablated mice. In a nutshell, our study indicates that sympathetic neurons are responsible for regulating pulmonary fibrosis. Keywords: Pulmonary fibrosis, sympathetic neuron, neuroimmune interaction.

**Presenter:** Stephen Edache

**Title: I**nvestigating Mosquito Abundance and Diversity on US Commercial Swine Farms

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**Keywords:** Mosquitoes; Swine; Abundance; Diversity; Disease vector

## Abstract

OBJECTIVE: The transmission of pathogens by mosquitoes is influenced by their abundance, diversity, and feeding behaviors. Some animals, such as swine and birds, act as reservoirs and amplifying hosts for mosquito-borne diseases, while others, like humans and horses, serve as dead-end hosts. In commercial swine operations, the high density of potential hosts creates an increased risk for severe disease outbreaks if pathogens are introduced. Despite this, there is limited knowledge about the presence of mosquito vectors around U.S. swine farms operating under varying biosecurity conditions. This study aimed to determine the abundance and species diversity of adult host-seeking and resting mosquitoes on commercial swine farms in southern Iowa between June and October 2024. METHODS: The study was conducted across five sow farms and five wean-to-market farms located in southern Iowa. Three sentinel mosquito traps were set at each swine farm: two of these traps, baited with dry ice, were positioned outdoors near potential larval and adult mosquito resting habitats such as sewage lagoons or ponds, and surrounding vegetation, while one was placed indoors–in the gestation barn of sow farms and in the barns of wean-to-market farms. Resting mosquitoes in outdoor habitats were also collected using aspirators. Sampling was conducted biweekly over two consecutive days throughout the summer and early fall. Collected samples were shipped on dry ice to the entomology laboratory at Kansas State University for processing, which included sorting, counting, sexing, and species identification. Initial species identification was performed using an artificial intelligence-based diagnostic system, with confirmation via morphological keys. RESULTS: While mosquito abundance fluctuated over time, it was consistently higher on sow farms compared to wean-to-market farms, with more mosquitoes found outdoors than indoors, and the majority captured in traps (for host-seeking mosquitoes) rather than in aspirators (for resting mosquitoes). The most abundant species belonged to the Culex genus, followed by mosquitoes from the Aedes and Anopheles genera, all of which are known vectors for arboviruses in livestock environments. CONCLUSIONS: Our preliminary findings highlight the abundance and diversity of mosquito vectors on swine farms, likely influenced by favorable habitats such as lagoons/ponds and nearby vegetation, and farm management practices. These findings underscore the importance of mosquito surveillance on swine operations, which can inform the development of effective vector control strategies, especially in the event of an arboviral outbreak.

**Presenter:** Ivy Elkins (Schmid)

**Title:** Evaluation of Efficiency and Sustainability of Cows with Diverse Genetics and Varying Forage Availability.

**Authors:** Ivy Elkins (Schmid)[1], Phillip A. Lancaster[2], BS, MS, PhD, Robert L. Larson[2], DVM, PhD, DACT, DACVPM (Epidemiology), ACAN

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**Keywords:** Beef; Sustainability; Forage; Efficiency; Profitability

## Abstract

The study aimed to assess how mature body weight, milk yield, and dry matter intake influence efficiency, profitability, and environmental outcomes using a stochastic cow herd simulation model, by replicating findings from Ferrell and Jenkins (1994). We hypothesized, cow genotype interacts with forage availability such that cows with lower growth potential and milk production have higher weaning weights (WW), lower methane emissions, and greater net profit on less abundant forages. Conversely, cows with higher growth potential and milk production will yield the same outcomes on abundant forages. The Beef Cattle Systems Model simulated a 100-head Kansas Flint Hills Angus cow-calf herd over 24 years, varying mature body weight (MSBW), peak lactation (LAC), and dry matter intake (DMI). Scenarios were iterated 150 times and used R Statistical Software to regress outcomes of kilogram weaned/DMI/cow exposed, kilogram weaned/methane emissions/cow exposed, and net profit/cow on annual DMI for varying MSBW and LAC. An inverse relationship resulted between increasing DMI and WW per DMI suggesting lower DMI maximizes efficiency across MSBW and LAC levels. Higher WW per unit of methane were achieved at lower DMI levels, indicating reduced environmental impact, with little influence of varying MSBW and LAC. Net profit peaked at moderate DMI for lighter MSBW cows, declining thereafter. Heavier MSBW cows reached highest profit at lower DMI; lesser LAC levels had greater net profit. Unlike the findings of Ferrell and Jenkins (1994), efficiency and net profit did not improve for cattle with greater growth and milk potential at greater DMI indicating that more productive cows may not be more efficient even in high nutrition environments.

**Presenter:** Kalie Fikse

**Title:** Imaging Diagnosis: Atypical CT Appearance of a Multilobular Osteochondrosarcoma in a Dog

**Authors:** Kalie Fikse[1]*, DVM, Clay Hallman[1], DVM, DACVR, Katherine Bauer[2], DVM, Kristen Hill-Thimmesch[2], DVM, DACVP, DACPV, MS, Maggie Richards[1], DVM, Maria Jugan1, DVM, DACVIM, MS,

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**Keywords:** canine; neoplasia; skull; multilobular osteochondrosarcoma

## Abstract

Introduction: Multilobular osteochondrosarcoma (MLO), also known as multilobular tumor of bone, is a rare tumor of dogs. Typically, dogs present with a slow growing firm mass at the skull with or without neurologic signs due to extension of the mass into the cranium. Although MLOs are most commonly reported in the skull, they have also been described affecting other sites such as the os penis. Treatment for MLOs is complete surgical excision. However, some studies have also utilized adjuvant therapy due to risk of tumor recurrence despite complete surgical margins. About 56% of MLOs will metastasize. Typical imaging characteristics of MLOs include a well defined, heterogeneous granular mineral mass, often referred to as having a 'popcorn' appearance. Case Description: A 9-year-old, female spayed Boxer presented to the KSU Veterinary Health Center for progression of a dorsal cranial mass. Four months prior, a small, soft rounded mass was noted dorsolateral to her left eye. Acute blindness, bilateral mucoid ocular discharge, and sclera hyperemia also developed at that time. Cytology of the mass was consistent with sarcoma. On presentation, physical examination revealed a 10.5 cm in diameter firm, non-painful mass over the calvarium. Ophthalmic exam revealed absent menace and direct pupillary light response (PLR) OS but normal indirect PLR; OD demonstrated normal menace and direct PLR but absent indirect PLR. Contrast-enhanced head CT was performed under general anesthesia. CT revealed a large, well-defined symmetrical, soft tissue attenuating, and centrally, poorly contrast enhancing mass extending from the dorsal calvarium to the subcutaneous tissues. There were several irregular, pinpoint to short-curvilinear mineral foci distributed peripherally. The mass had a markedly enhancing capsule with multiple thin, internally radiating, projections. Focal regions of permeative lysis were present at the frontal bones with adjacent amorphous periosteal reaction. An additional region of geographic lysis was at the right parietal bone with a small contrast enhancing area within the right parietal lobe. The aggressive imaging characteristics with potential intracranial extension was consistent with the previously diagnosed sarcoma. Based on the location and symmetry, it was hypothesized that the capsule of the mass indicated lifting of the periosteum with secondary, extensive sub-periosteal mass. Therefore, bone or cartilage origins for the sarcoma were prioritized. Ultrasound guided biopsy of the mass was performed. The dog was discharged with gabapentin and carprofen. Unfortunately, the dog was euthanized twelve days later due to progressive neurologic signs. On postmortem exam and subsequent histopathology, the histologic features of the neoplasm were consistent with a grade III MLO. Discussion: Based on a literature review, this is the first report of a minimally mineralized MLO with a strong contrast enhancing capsule in veterinary medicine. The imaging characteristics also support prior theories that MLOs arise from the periosteum as the tumor seemed to be encompassed by the periosteum, which was suspected to be the contrast enhancing capsule seen on CT. Histopathology showed compressed collagen surrounding the mass, which is consistent with either the periosteum or subcutaneous collagen. However, periosteum and subcutaneous collagen cannot be definitively differentiated on histopathology.

**Presenter:** Bryce Gabbard

**Title:** Development of an Artificial Feeding System to Rear Cat Fleas (Ctenocephalides Felis)

**Authors:** Bryce Gabbard[1], B.S Biology, Wesley Simms[2], Cameron Sutherland[1], DVM, Brian H Herrin[1*], DVM, PhD, DACVM (Parasitology)

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## Abstract

Currently, it is common practice to use live cats to raise and test insecticide products on cat fleas (Ctenocephalides felis), but this can be expensive and represents a potential area for animal replacement. While there are currently artificial feeding systems, the current systems are large and costly and may not be feasible or appropriate for all flea studies. The implementation of a 3D-printed artificial flea-feeding system can be a cost effective, adaptable, and sustainable animal replacement solution for the future of insecticide evaluation. We hypothesize that a 3D-printed artificial flea-feeding system can produce a similar amount of viable egg production compared to on-animal rearing. To test this, 6 artificial systems were created to rear fleas with the ability to manipulate different factors such as blood temperature, humidity, blood type, substrate within the housing environment, and the feeding membrane. Fleas feeding within this system are monitored by egg collection, frass collection, Hemoccult® fecal blood tests, and viewing fleas under a dissection microscope for signs of blood feeding. After testing many variables, a single egg was collected from a flea apparatus that was set up with a blood membrane temperature of 37ºC, 85% relative humidity, a Parafilm® membrane with a mesh netting covering the membrane and defibrinated bovine blood. Two positive Hemoccult® tests support evidence of blood within the fleas despite the lack of egg production. The control cat used for production comparison yielded an average of 111.8 flea eggs per day. Artificial flea feeding is a necessary step in long-term insecticide evaluation, but more work is needed to refine the artificial system to improve flea feeding and egg laying.

**Presenter:** Alyssa Hobbs

**Title:** Behaviors of Beef-Dairy Calves that Received a Dose of Maternal Bovine Appeasing Substance (MBAS) at Weaning

**Authors:** Alyssa Hobbs[1], B.S.; Eduarda Bortoluzzi[2], MV, MS, PhD, Rebecca Bigelow[1*], MS; Jordana Zimmermann[1], MV, MSc

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**Keywords:** welfare; calves; maternal bovine appeasing substance

## Abstract

Weaning processes cause unavoidable distress in calves. Maternal bovine appeasing substance (MBAS) is a naturally secreted pheromone inducing a calm effect in offspring. Transdermal application of an analog MBAS has been reported to decrease distress in cattle and stress related behaviors after its application. The main objective is to compare the behaviors of calves that received a MBAS dose (MBAS; n=13) to a placebo dose at first day of step-down weaning (control; n=13). Thirty-minute videos were collected, and behaviors were annotated of 26 beef-on-dairy calves (72±6 kg) at baseline (-1d), treatment and weaning day (0d), and 3 days post-treatment (3d) during morning milk feedings. Structural behaviors included standing, laying, nutritive-oral-behaviors, non-nutritive-oral-behaviors, head still, grooming, and vocalizing. Spatial behaviors included close or far from milk-bottle holder. Linear mixed models with fixed effects of day, treatment, and treatment × day were used to analyze behavior variables. Calf and weight block were used as random effects. There were no treatment or treatment × day effects on structural and spatial behaviors ($P>0.05$). Number of vocalizations, standing time percentage, and head still percentage increased after weaning in both treatments ($P<0.01$). Application of a MBAS dose did not influence calves' structural or spatial behaviors during a step-down weaning.

**Presenter:** Abi Huber

**Title:** Effect of Ehmer Sling on Hip Joint and Evaluation of Efficacy and Tolerability of DogLeggs® Ehmer Sling with Vest

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**Keywords:** Ehmer; luxation; coxofemoral; hip; sling

## Abstract

Ehmer slings are applied after closed reduction of craniodorsal hip luxation to maintain hip flexion, internal rotation and abduction. They can be poorly tolerated and/or cause soft tissue injuries. A commercial vest with Ehmer sling is available and may be more practical but has not been studied. The objectives of this study are to report the hip position obtained after placing an Ehmer sling and the vest and assess the dog's tolerance of this vest during use. All dogs underwent placement of Ehmer sling and goniometric measurements for hip position. The sling was removed, the vest fitted, and measurements repeated. The vest stayed on for up to 14 days and the owner received a daily questionnaire. 7 healthy dogs of various breeds between 2-8 years old and ≥25 kilograms were included. Mean flexion angle was greater for the Ehmer (64.9° ± 14.3) than the vest (51.9 ±14.9). Internal rotation with the Ehmer was positive (2.3° ± 14.8) and negative with the vest (-3.3°± 6.8). Abduction with the Ehmer was less (7.7° ± 5.8) than with the vest (13.7° ± 4.5). Abduction was the only parameter significantly different between the Ehmer and the vest (p=0.0436). 1/7 dogs kept the sling in place for 14 days, 2/7 dogs kept the sling in place for 4-6 days, and 4/7 dogs failed out of the study due to lack of tolerance and/or Velcro failure. Soilage and slippage was reported in all dogs. No soft tissue injuries were reported. In conclusion, hip position with the vest was significantly different only in abduction. This may be beneficial for better femoral head coverage and decreased risk of reluxation. However, the vest was not tolerated and/or did not stay in place for 6/7 dogs.

**Presenter:** Prabhu Joshi

**Title:** Role of Beta-2 Adrenergic Receptor Signaling in Innate Immunity Against Intracellular Bacterial Pathogen

**Authors:** Prabhu R. Joshi[1], Abigail Judd[1], Pankaj Baral[1*]

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**Keywords:** Beta2-AR; BMDMs; Beta2-AR agonist

## Abstract

Burkholderia thailandensis is a model organism for studying melioidosis due to its similarity to pathogenic mechanisms of highly virulent B. pseudomallei, an intracellular pathogen causing pneumonia in animals and humans. The bacterium evades phagolysosome formation, proliferating within macrophages and leading to antibiotic-resistant infections. Lungs are densely innervated with sympathetic neurons that secrete neurotransmitter noradrenaline (NA) from their endings during homeostasis and inflammation/injury. NA acts on tissue-resident immune cells (such as macrophages) in the lungs, mainly through β2-adrenergic receptors (β2-ARs). Our in vivo findings showed reduced survival, worse clinical signs, and increased hypothermia in β2-AR-deficient mice (Adrb2-/-) than in control mice after intranasal infection with B. thailandensis. These findings correlate with significantly increased bacterial load recovery in the lungs, liver, and spleen from Adrb2-/- mice than the bacterial recovery in control mice at 24h of post-infection. Similarly, Adrb2-/- bone marrow-derived macrophages (BMDMs) co-cultured with B. thailandensis showed enhanced intracellular survival of bacteria than wild-type BMDMs infected with B. thailandensis. Additionally, treatment of infected wild-type BMDMs with β2-AR agonist significantly reduced the intracellular survival of bacteria. Our results suggest that the β2-AR signaling pathway to macrophages controls intracellular bacterial infection.

**Presenter:** Sujan Kafle

**Title:** Single-Cell Analysis of Host Responses in Bovine Milk Somatic Cells (bMSCs) Following HPAIV Bovine-H5N1 Influenza Infection

**Authors:** Sujan Kafle[1], Gagandeep Singh[1], PhD, Patricia Assato[1], PhD, Mankanwal Goraya, PhD[2], Igor Morozov[1], DVM, PhD, Juergen A. Richt[1]*, DVM, PhD

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**Keywords:** scRNA-seq; Bovine Milk Somatic Cells; Highly Pathogenic Avian Influenza Virus; Cattle H5N1

## Abstract

The 2024 outbreak of highly pathogenic avian influenza virus (HPAIV) H5N1 in U.S. dairy cattle presented an unprecedented scenario where the virus infected bovine mammary glands and was detected in milk, raising serious concerns for the dairy industry and public health. Dairy cows infected with the H5N1 virus showed severe clinical symptoms such as reduced appetite, mastitis, and decreased milk production. To understand the host immune responses and changes particularly in the mammary gland, we performed scRNA-seq analysis on bovine milk somatic cells (bMSC) after H5N1 infection. We identified ten distinct cell clusters and observed a shift toward type-2 (Th2) immune responses, characterized by T-cells expressing IL-13 and GATA3, and three different subtypes of epithelial cells based on the gene expression associated with milk production. Our study revealed temporal dynamics in cytokine expression, with a rapid decline in luminal epithelial cells and an increase in macrophages and dendritic cells, the latter suggesting an induction of the early innate immune cascade. These findings indicate that bovine H5N1 infection in the mammary gland triggers complex immune responses involving both pro-inflammatory and regulatory pathways. This research fills a critical gap in understanding the immune responses of bovine mammary glands to H5N1 infection and highlights the need for further investigation into therapeutic strategies for managing such outbreaks.

**Presenter:** Brigette King

**Title:** STAR-Trax – Tracking the Lone Star Tick's Seasonality and Impact.

**Authors:** Brigette King[1], BS, Brian H Herrin[2*], DVM, PhD, DAVCM (Parasitology), Victoria Chaplin[2], BS, Lucy Schermerhorn[3], BS, Sydney Henry[3], BS, Meredith Edelmon[3], BS, Gabby Lorino[3], BS

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**Keywords:** Kansas; tick; lone star

## Abstract

Several tick species of medical and veterinary significance are endemic to Kansas, the most prominent of which is Amblyomma americanum (the lone star tick). Understanding the distribution of ticks across eastern Kansas and how their populations change over time is important for disease modeling and public health awareness. Ticks were collected from six sites in eastern Kansas from March to November of 2024 via $CO_2$ trapping and dragging. A total of 126,263 ticks were collected, 125,946 (99.75%) of which were identified as A. americanum, and of those 53.13% were collected by trap and 46.86% by drag. The other species identified were Amblyomma maculatum (n=14, 0.01%), Dermacentor variabilis (n=190, 0.15%), and Ixodes scapularis (n=72, 0.09%). The peak month for adult and nymph lone star ticks was April with an average of 240.7 female, 239.9 male, and 1063.7 nymphs per collection day, while the larvae were collected at the highest numbers in August (avg = 4888.5). Amblyomma americanum were collected in every bimonthly trapping event, providing an expanded seasonality of this tick in Kansas. Given the collection sites were also public recreation area, it is critical to communicate the importance of proper tick prevention to wildlife and outdoor recreation enthusiasts.

**Presenter:** Jimena Kilian

**Title:** Fluoroquinolones Are a Risk Factor for Cranial Cruciate Ligament Ruptures in Retrievers

**Authors:** Jimena Kilian[1], Kate KuKanich[2*], DVM, PhD, DACVIM (SAIM), Jessica Bunch[2], DVM, Butch KuKanich[4], DVM, PhD, DACVCP, Steve Martinez[4], DVM, MS, DACVS, DACVSMR, Alexa Korsberg[3], Richard Evans[5], PhD, PSTAT

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**Keywords:** Fluoroquinolones, Cranial Cruciate Rupture, Preventative

## Abstract

Background- Cranial cruciate ligament rupture (CCLR) is common in Retrievers, producing lameness and often requiring surgery and rehabilitation. In humans, fluoroquinolones and glucocorticoids have been associated with tendon rupture and ligament damage.

Hypothesis- A higher proportion of Retrievers with CCLR would have previous exposure to fluoroquinolones or glucocorticoids than Retrievers without CCLR.

Animals- Labrador and Golden Retrievers and Retriever-crosses, 2-12 years-old, from Kansas State University and Washington State University both with CCLR (N=218, "cases") and without CCLR (N=203, "healthy controls").

Methods- Retrospective, multi-institutional case-control study from 2019-2023. Medical records were reviewed for exposure to fluoroquinolones or glucocorticoids within 6 months of injury or visit (control) or anytime throughout life prior to injury or visit, and recorded as systemic or topical. Data were analyzed using Fisher's exact test, Chi-Square test, and Odds Ratio.

Results- CCLR dogs (37kg) weighed more than controls (32kg) (p< 0.001). Labradors had a higher rate of CCLR (118/218) than Goldens (36/218), (p=0.019). Lifetime systemic fluoroquinolone exposure was reported from 18/218 (8%) cases compared with 5/203 (2%) controls (p= 0.010, OR 3.564). Lifetime systemic glucocorticoid exposure was reported from 73/218 (33%) cases compared with 25/203 (12%) controls (p<0.001, OR 3.584). No association was identified between CCLR and use of systemic fluoroquinolones or glucocorticoids within 6 months of injury or topical fluoroquinolones or glucocorticoids at any point in the dogs' lives.

Conclusions and Clinical Importance- These data suggest systemic fluoroquinolones and glucocorticoids are a risk factor for CCLR in Retrievers and should be used cautiously in these breeds.

**Presenter:** Kate Lewis

**Title:** BriteVu vs Omnipaque: Computed Topography Imaging of Hedgehog (Atelerix Albiventris) Vasculature

**Authors:** Kate Lewis[1], Dylan Wootton[1], Jordan Daugherty[2], M. Scott Echols[4], DVM DABVP, and Jeremy Klingler[3], MS PhD

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**Keywords:** Vascular anatomy; hedgehog; contrast

## Abstract

Increasingly, hedgehogs are becoming popular small exotic pets. As such, there is a rising demand for anatomical information on these animals, especially in regards to potential injection, blood draw, and IV sites among exotic animal veterinarians. Additionally, descriptions of the vasculature of these animals in the literature is extremely limited. Here, we address this knowledge gap. A pygmy African hedgehog (Atelerix albiventris) was injected via the right cephalic vein with the contrast-enhancers Omnipaque 300, the clinical standard perfused in vivo, and BriteVu, a new terminal/post-mortem medium, to (1) allow us to map the venous vasculature of the animal which will vitally aid clinicians in relevant procedures and (2) compare-and-contrast the efficacy of both contrast-enhancers on the market. Hedgehog vascular anatomy mirrors that of rodents and lagomorphs, most notably with paired left and right cranial vena cavae. To isolate and model the vessels we used the freeware program, 3D Slicer. Volumetric analysis revealed the control contained 6.7 cm3 of detectable vasculature while Omnipaque 300 contained 9.4 cm3 and BriteVu yielded 20.1 cm3. BriteVu was found to have superior visibility to Omnipaque 300, producing a 113% increase in overall vascular contrast and revealing some of the smallest vessels including the hepatics, pulmonaries, and internal vertebral venous plexuses. In conclusion, BriteVu provided the greatest potential to visualize vessels for research purposes that will aid in clinical practice. Further research is warranted to continue mapping the vessels of hedgehogs as well as applying this technique to other small exotics.
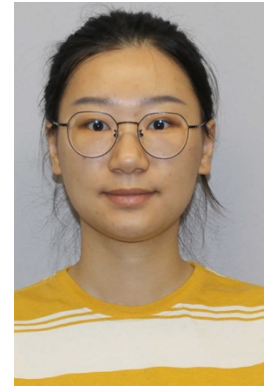
**Presenter:** Danqin Li

**Title:** Could Viral Vaccines Be Used as Alternatives for Antimicrobials? Insights From U.S. Swine Veterinarians

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**Keywords:** Swine viral diseases; Vaccine opportunities and challenges; Antimicrobial reduction; Veterinary insights

## Abstract

Introduction According to the FDA, in 2023, swine accounted for the highest percentage (44%) of medically important antimicrobial sales among all food-producing animals as measured in kilograms. Additionally, swine was also the only category to have experienced four consecutive years of rising antimicrobial sales from 2020 to 2024. Swine viral diseases often result in severe clinical signs due to secondary bacterial complications, necessitating the use of antimicrobials. Vaccines can effectively reduce the infectious disease burden and greatly decrease the demand for antimicrobials in swine health management. Veterinarians play a vital role in guiding producers' vaccine use; however, reports about their insights on current vaccines are lacking. This study seeks insights from U.S. swine veterinarians on the safety, efficacy, availability, and cost of current viral disease vaccines, aiming to identify limitations and explore opportunities for better vaccines. Methods Data collection included two phases: an online cross-sectional survey of swine veterinarians followed by interviews for additional insights. This study sought their insights on the safety, efficacy, availability, and cost of current viral disease vaccines. The survey was based on their expert opinions and practical experiences. Data were exported from Qualtrics to Microsoft Excel for preliminary statistical management and then visualized by using GraphPad Prism (version 10). Results Between June and August 2024, survey invitations were sent to 200 veterinarians. 23% (46/200) of veterinarians responded, 19 completed the survey and 5 participated in the interviews. The respondents, averaging 24 years of experience, primarily practiced in the Midwest, which has the highest density of swine in the U.S., with an average responsibility of 482,736 pigs. Porcine reproductive and respiratory syndrome (PRRS) (84%), Swine influenza (SIV) (79%), and Rotaviral enteritis (79%) are the top three viral diseases urgently needing better vaccines. Over 25% of veterinarians reported using antimicrobials to manage secondary bacterial complications for these three diseases. Our study also found out that current viral disease vaccines share common challenges but also have vaccine-specific limitations. A major issue affecting all three viral vaccines is the lack of cross-protection against emerging variants. Specific challenges include the risk of virulence reversion in PRRS vaccines, the interference of maternally derived antibodies (MDA) in SIV vaccines, and the difficulties in adapting type C Rotavirus (RVC) to cell culture. Notably, while veterinarians generally view the current vaccines as moderately effective and somewhat expensive, they are still willing to pay over 28% more for better vaccines, which shows their desire to have better vaccines in their toolbox. Discussion By identifying the common and vaccine-specific challenges, we were able to

propose targeted improvement strategies for each vaccine. For PRRS, needle-free intradermal administration shows promise, as it offers faster immune responses, lower vaccine viremia, and reduces the risk of recombination. For SIV, adenovirus-vectored vaccines can resist MDA interference and provide long-lasting immunity. For RVC, customized prescription vaccines can bypass propagation issues while maintaining a similar cost. Our study suggested that using vaccines as alternatives to antimicrobials will be a long-term process, requiring the insights from veterinarians in exploring effective and sustainable solutions.

**Presenter:** Maddie Mancke

**Title:** The Use of Lidocaine-Infused Castration Bands to Castrate Beef-Dairy Calves and Its Effect on Animal Welfare and Performance

**Authors:** Madeline Mancke[1], Eduarda Bortoluzzi[2*], MV, PhD, Payton Dahmer[3], PhD, Brad White[4], DVM, MS

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**Keywords:** banding; castration; cattle; lidocaine; welfare

## Abstract

Castration is a widely used management practice in livestock production, though concerns regarding animal welfare following the procedure persist. The objective of this study was to compare the behavior, performance, and blood parameters of calves castrated using a lidocaine-infused castration band (Lidoband™; LLB) versus a standard band with no pain relief (CONT). In this blinded, randomized controlled trial, 26 male beef-dairy cross calves were monitored for 7 weeks following castration. There were no significant differences between the treatment groups in overall body weight, average daily gain (ADG), feed conversion (G:F), clinical illness scores, wound scores, or approach test results. However, treatment differences were observed in weekly ADG and G:F (P ≤0.05). Additionally, a significant treatment by time interaction was found for the number of lying bouts and average stand bout duration (P ≤0.05), with calves banded with Lidoband™ showing more movement around time of scrotal sloughing, compared to the control calves.

A significant difference was also noted in the number of wound licks (P ≤0.05). Both acute and chronic pain were associated with band castration, regardless of the treatment. Weekly performance analysis and behavioral patterns during wound granulation (days 21-35 post-castration) indicated positive outcomes for calves in the LLB group. Banding with an LLB demonstrated beneficial effects on both performance and behavior, suggesting improved animal welfare.

**Presenter:** Lauryn Mauler

**Title:** Do Swine Farms Have a Mosquito Problem?

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**Keywords:** mosquitoes; swine; abundance

## Abstract

Mosquitoes can transmit viruses resulting in disease losses in various host species, including swine. However, the impact of mosquitoes on swine farms has not been assessed. Our objectives were to investigate the abundance and diversity of adult mosquitoes, identify the host species mosquitoes fed on, and assess mosquito habitats in commercial swine farms located in southern Iowa. Four sow farms and four wean-to-market farms were enrolled. Per farm, two mosquito traps were placed outdoors near mosquito-rich habitats including sewage lagoons, water troughs, and tall grasses, and one trap was placed indoors to collect adult host-seeking mosquitoes. Adult resting mosquitoes were collected by aspirating resting habitats around the farms. Information about biosecurity measures, ventilation systems, insect control measures and weather variables were recorded at each collection. Samples collected biweekly were sorted by species, identified and enumerated. Species identification was performed using an artificial intelligence algorithm-based diagnostic system and DNA barcoding. Host blood collected from fed mosquitoes was collected and analyzed by RT-PCR using cytochrome b and 16S rRNA markers to identify the host source. Preliminary data indicates a higher number of mosquitoes were collected from traps in sow farms compared to wean-to-market farms. Culex constituted the most abundant mosquito found, followed by mosquitoes of the Aedes and Anopheles genera. All are considered important vectors capable of propagating arboviral infections in livestock farms. The results of this study highlight the importance of mosquito surveillance in swine operations and can help inform reduction strategies during an arboviral outbreak.

**Presenter:** Cheyla Myrick

**Title:** Detection of Environmental Pollutants in Canine Tissues

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**Keywords:** Environmental Contamination; Persistent Organic Pollutants (POPs); Hydrocarbon

## Abstract

Environmental contamination poses a significant threat to animal and human health, potentially leading to conditions such as cancer. Contamination can originate from known sites such as superfunds, agricultural areas, landfills, and oil and gas fields, which are prevalent throughout Kansas and neighboring states. This pilot study utilizes gas chromatography-mass spectrometry (GC-MS) to detect environmental pollutants in canine tissues. Our hypothesis is that exogenous persistent organic pollutants (POPs) will be detected in canine adipose tissues due to their lipophilic nature. We analyzed fat samples from eight dogs and testicular samples from two dogs at the Kansas State Veterinary Health Center. Their health statuses were without diagnosis of malignancy (n=6) and diagnosed with malignancy (n=4). Hydrocarbons were detected in all samples, with tetradecane—a petroleum-derived compound—found in seven samples. While direct acute exposure to high levels of hydrocarbons can cause pulmonary complications and CNS toxicity in humans, the health effects of chronic exposure remain unknown. Our findings suggest potential environmental exposure to oil and gas among dogs in this study. Given that pet animals and humans are exposed to similar environments, our findings could serve as a warning for future human health risks. Our next step is to quantify hydrocarbon concentrations in our samples and enhance our search for synthetic chemicals such as perfluoroalkyl substances (PFAS), which have been linked to several types of human cancers, using a more sensitive methodology. Future research will assess the site-specific contaminants, long-term health effects of these contaminants, and explore the association between POPs and cancer. Research Grant: Department of Clinical Sciences, College of Veterinary Medicine, Kansas State University Student Support: National Institutes of Health T35 Training Grant.

# Phi Zeta RESEARCH DAY
## KANSAS STATE UNIVERSITY
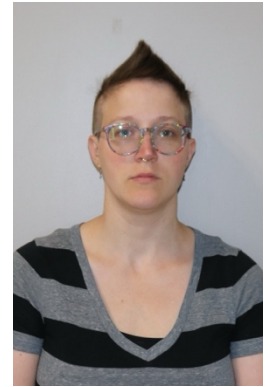
**Presenter:** Jett Novotny

**Title:** Markers of Bacterial Translocation and Systemic Inflammation in Dogs with Myxomatous Mitral Valve Disease

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**Keywords:** cardiovascular; gastrointestinal; MMVD; dogs; canine

## Abstract

Introduction Cardiovascular disease (CVD) decreases gastrointestinal (GI) perfusion, leading to hyperpermeability, bacterial translocation, and systemic inflammation. Systemic inflammation causes cardiac inflammation and is associated with CVD progression in humans. While GI signs and intestinal dysbiosis have been reported in canine CVD, further evaluation of the gut-heart axis in dogs with myxomatous mitral valve disease (MMVD) is needed. Methods This prospective study evaluated the association between bacterial GI translocation, systemic and cardiac inflammation, and CVD severity in dogs with untreated MMVD. Client-owned dogs [n=25 without increased left atrial pressure or congestive heart failure (CHF; group 1); n=11 with increased left atrial pressure +/- CHF (group 2)] were enrolled concurrently with an echocardiogram. Serum lipopolysaccharide (canine LPS ELISA), high-sensitivity cardiac troponin (Advia Centaur CP), and cytokine panel [interleukin (IL)-2, IL-6, IL-8, tumor necrosis factor (TNF)-alpha] (MSD multiplex) were measured at enrollment. Non-parametric analyses [Mann-Whitney, Spearman rho (rs), Fisher exact tests] were performed to compare relationships of variables and proportions between groups. Results GI clinical signs were less common in group 1 (20%) than group 2 (66.7%; relative risk 0.22; P&lt;0.0001). Serum LPS concentration was higher in group 2 (median, 9.3 ng/mL) compared to group 1 (5.8 ng/mL; P&lt;0.05) and positively correlated with IL-6 (rs=0.82, P=&lt;0.0001). LPS was negatively correlated with TNF-alpha (rs=-0.45, P=0.01). Conclusions GI clinical signs were more common in dogs with advanced MMVD compared to early CVD stages. Higher LPS concentrations in dogs with advanced MMVD supports an association between CVD severity and GI hyperpermeability.

# Phi Zeta RESEARCH DAY
## KANSAS STATE UNIVERSITY

**Presenter:** Chinemerem Onah

**Title:** Nociceptor Sensory Neurons Augment Antifungal Immunity during Lethal Aspergillus fumigatus Pneumonia

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**Keywords:** Neuroimmunity; Lungs; Pneumonia; Aspergillosis

## Abstract

Immunocompromised individuals are more likely to acquire Invasive Pulmonary Aspergillosis (IPA) and lethal pneumonia caused by Aspergillus fumigatus. These lead to dysregulated inflammation, altered immune responses, and airway barrier destruction. IPA treatments fail to provide absolute protection and come with substantial clinical limitations. Nociceptor sensory neurons innervate the bronchioles and airways and aid homeostasis and immune cell functions. However, the role of lung-innervating nociceptors during lethal A. fumigatus pneumonia is unknown. Here, we found that nociceptor sensory neuron ablation in mice led to a reduced survival outcome after lethal A. fumigatus pneumonia. Post-infection bronchoalveolar lavage analysis demonstrated increased fungal clearance, higher inflammatory cytokine levels, and immune cell recruitment in these mice. However, they experienced exaggerated inflammation and lung damage that led to fungal dissemination and reduced survival. Furthermore, we found that the neuropeptide calcitonin gene-related peptide (CGRP) increases the phagocytosis and killing capacity of neutrophils, monocytes, and macrophages after coincubation with A. fumigatus. Altogether, our data show that nociceptor neurons and their secreted CGRP regulate the extent of collateral inflammation and lung damage that occurs during A. fumigatus pneumonia. Our results suggest that the nociceptor-immune crosstalk is a potential therapeutic target for the treatment of IPA.

**Presenter:** Saurav Pantha

**Title:** Females with Obesity Suffer from More Severe Disease Following Influenza A Virus Infection

**Authors:** Saurav Pantha[1], DVM, Saranya Vijayakumar[1], PhD, Shristy Budha Magar[1], DVM, Brian Wolfe[1], BS, Tawfik Aboellail[2], DVM, MS, PhD, Santosh Dhakal[1]*, DVM, MS, PhD

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**Keywords:** influenza A virus; diet-induced obesity; sex difference

## Abstract

Introduction: Influenza A viruses (IAVs) cause seasonal influenza outbreaks and have the potential to cause pandemics. Available evidence suggests that biological sex (i.e., being male or female), as well as obesity, independently play important roles in IAV pathogenesis. However, their interaction during IAV pathogenesis has not been pursued yet. This study aims to explore the effects of biological sex and obesity during IAV pathogenesis in a diet-induced obesity (DIO) mouse model. Methodology: Four- to five-week-old male and female C57BL/6 mice were fed with either a high-fat diet (HFD, 60kcal% fat) or a control diet (10kcal% fat) for 13-14 weeks, and body mass was recorded weekly. Obesity was defined as having ≥20% body mass compared to the average body mass of age- and sex-matched mice on the control diet. There were four experimental groups: non-obese males, non-obese females, obese males, and obese females. Mice were inoculated intranasally either with a lethal/high dose ($10^3$ TCID50) or a sublethal/low dose ($10^{1.5}$ TCID50) of mouse-adapted A/California/04/2009 H1N1 IAV. Change in body mass was recorded daily up to 21 days post-infection (dpi), and mice that lost ≥25% of body mass were humanely euthanized. Subsets of mice were euthanized on different dpi to collect tissue samples for virus titration, histopathology, flow cytometry, and cytokines/chemokines measurement. Results: After 14 weeks of HFD treatment, 100% of the male and 70% of the female mice became obese, indicating the sex difference in the progression of obesity. However, the male and female mice with obesity similarly had significantly greater body mass, adipose tissue deposition, plasma leptin and total cholesterol concentrations, and glucose intolerance compared to their non-obese controls. After a lethal dose infection, the median survival time was shorter for female non-obese and obese mice compared with their male counterparts. A subset of mice, infected with the lethal dose and euthanized at 3 dpi, showed similar virus replication in the lungs. However, hematoxylin and eosin (H&E) staining showed significantly higher inflammation of lung parenchyma in female mice with obesity. Obese female mice also had higher fold changes in cytokines associated with the Th17 pathway, including IL-17A, IL-23, and IL-22, and chemokine MIP1α responsible for immune cell infiltration. After the sublethal dose infection, mice from all groups became sick, and obese mice had greater body mass loss. Among the four groups, the percentage change in body mass from the baseline was highest in females with obesity. Importantly, 25% (i.e. 2/8) of the females with obesity reached the humane endpoint and required euthanasia, indicating that they suffer from more severe IAV pathogenesis than other groups. Flow cytometry analysis of the lungs at 3 dpi, after sublethal dose infection, showed comparable neutrophil and alveolar macrophages but reduced interstitial and inflammatory monocytes and macrophages in obese males and females. Conclusion: Our study shows that females with obesity experience greater severity of IAV pathogenesis in a mouse model. This is likely to be mediated by dysregulated inflammatory responses, including Th17-mediated immunopathology, cytokines/chemokines alteration, and disproportionate immune cell infiltration.

**Presenter:** Briana Raya

**Title:** First Detection of Echinococcus Multilocularis in Wild Canids in Kansas and Missouri

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**Keywords:** Kansas; Missouri; Echinococcus; Multilocularis

## Abstract

Echinococcus spp. are zoonotic tapeworms of wild canids that also infect humans and domestic animals. With recent scattered geographic intestinal and hepatic cases of Echinococcus multilocularis infections in the United States poses the need to conduct surveillance and sequencing of this intrusive parasite. Coyote carcasses were collected from Kansas (n=53) and Missouri (n=52). Positive samples were morphologically and molecularly identified using traditional PCR and sequencing. We sequenced a singular E.multi tapeworm from each coyote, using Gesy primers and gene targets cob and nad2. In Kansas, 47% (25/53) of coyotes and in Missouri, 38% (20/52) of coyotes were found positive for Echinococcus spp. All positive samples were morphologically and molecularly, identified as E. multilocularis with sequences closely matching a published European haplotype. This is the first description of E. multilocularis in a canid in Kansas and the first systematic description in Missouri. This study shows the expanding known range of E. multilocularis in the US, affirming the need for continuous surveillance of wild canids and rodents in previously thought non-infective areas. As coyote populations increase in urban areas, so does the zoonotic threat of Echinococcus spp. for humans and domestic dogs.
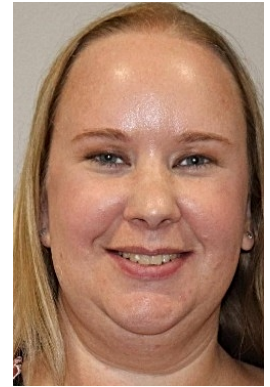
**Presenter:** Amanda Roth

**Title:** Hookworm Benzimidazole Resistance Allele Occurrence in Kansas Dogs

**Authors:** Amanda Roth[1], Jeba R J Jesudoss Chelladurai[2*], BVSc & AH, MS, PhD Grace Schieferecke[3], Undergrad student, Theresa A. Quintana[4], BS, MS,

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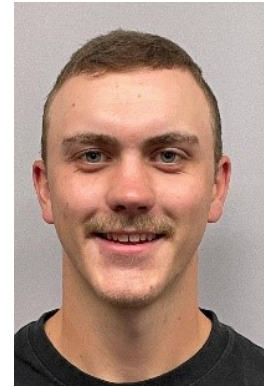[3]Division of Biology, Kansas State University, Manhattan, KS, USA
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**Keywords:** Hookworm; Benzimidazole; Resistance Allele; Ancylostoma caninum; beta-tubulin

## Abstract

Ancylostoma caninum, the canine hookworm, is one of the most prevalent intestinal worms in the United States. The overall prevalence of hookworms in Kansas dogs is 1.87% in 2024, with county-specific prevalence ranging from 1 to 53%. Benzimidazoles (fenbendazole and febantel) are one of the primary treatments for hookworm infections. These drugs target beta-tubulin subunits, inhibiting microtubule polymerization within parasite cells. However, increasing resistance to benzimidazoles has been reported across all breeds, ages, and sexes of dogs. Resistance is associated with two single nucleotide polymorphisms in the beta-tubulin gene at codons 167 (TTC>TAC; F->Y) and 134 (CAA>CAT; Q->H). There is a knowledge gap about the prevalence of these single nucleotide polymorphisms in canine hookworms across many U.S. states. In this study, we investigated these 2 single nucleotide polymorphisms in ~100 canine fecal samples originating in Kansas. We hypothesized that the mutations of A. caninum single nucleotide polymorphisms at Q134H and F167Y are prevalent in dogs from Kansas. We performed fecal floats to isolate eggs and extracted their DNA. We performed quantitative polymerase chain reaction (qPCR) using primers previously designed for codon 167 (Schwenkenbecher et al.) and custom designed primers for codon 134. Our analysis determined the frequency of susceptible and resistant alleles for each codon. Results revealed considerable variation in allele frequencies within and among the samples, ranging from <1% to 100%. These findings provide evidence of potentially significant resistance to benzimidazoles within A. caninum in infected Kansas dogs. These results have clinical implications for future benzimidazole use and potential widespread resistance without judicious drug management.

*March 11, 2025*

**Presenter:** Jacob Schumacher

**Title:** Evaluation of ClipFitter as a Novel Method of Castration for Calves

**Authors:** Jacob Schumacher[1], Eduarda Bortoluzzi[1*], MV, MS, PhD, Charley Cull[2], DVM, PhD, Johann Coetzee[1], BVSc, PhD, DACVCP, DACAW, ECAWBM

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**Keywords:** castration; welfare; calves; pain

## Abstract

Physical castration of male calves is a standard management practice that causes pain. The Burdizzo castration method has demonstrated welfare benefits in calves compared to surgical or band castration but exhibits high risk of failure. ClipFitter is a novel castration clip that combines attributes of Burdizzo and band castration which could reduce failures and improve welfare. This randomized blinded controlled trial aimed to compare the ClipFitter and standard band castration methods and their effects on pain and welfare. Twelve male Holstein calves weighing 84 ± 2 kg were assigned to 1 of 3 treatment groups; castration with ClipFitter (CLIP; n=4), castration with standard band (BAND; n=4), or no-castration (SHAM; n=4). Calves lie/stand behavior, plasma cortisol, Substance P, and infrared thermography were assessed in multiple timepoints. Linear mixed-effects models were used to determine potential associations between outcomes on treatment, time, and their interaction. Scrotum infrared thermography revealed a treatment by time interaction ($P<0.05$). CLIP calves exhibited significantly lower scrotal temperature than SHAM calves at 7 d post-castration. CLIP calves presented shorter time within a lie-bout compared to SHAM, while BAND presented greater time within a stand-bout compared to SHAM ($P<0.05$). There were no significant differences in plasma cortisol or Substance P concentrations between treatments ($P>0.05$). Decrease in scrotal temperature suggests a faster blood flow constriction when the ClipFitter is utilized compared to castration bands. Changes in lie/stand bouts indicated that both castration methods alter behavior causing discomfort and possibly pain. Further research is warranted to evaluate implications for a longer period.

**Presenter:** Hari Balaji Sridhar[1] BVSc, MVSc

**Title:** Prevalence of *Salmonella enterica* in Feces of Beef-on-Dairy Cattle: Investigating Management Factors in Calves and Growers

**Authors:** Hari Balaji Sridhar[1], BVSc, MVSc, Raghavendra G. Amachawadi[1*], BVSc, MS, PhD, Sri Nithya Dasari[1], BVSc, MSc, Haiyan Wang[2], PhD, Taghreed Mahmood[1], BVM, Harith Salih[1], BVM, MS, Haitham Alneaemy[1], BVM, Phillip A. Lancaster[1], PhD, Anthony J. Tarpoff[3], PhD, Paul R. Broadway[4], PhD, Kristin E. Hales[5], PhD, Tera Barnhardt[6], DVM, MS, Miles E. Theurer[7], DVM, PhD, Charley A. Cull[8], DVM, PhD, T.G. Nagaraja[9], BVSc, MVSc, PhD

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**Keywords:** *Salmonella;* Beef-on-dairy; Non-typhoidal Salmonellosis; Food-borne pathogens

## Abstract

*Salmonella enterica* is a foodborne pathogen of major public health concern. In the US, non-typhoidal *Salmonella* is estimated to cause annually about 1.35 million infections, 26,500 hospitalizations, and 420 deaths. Being a pathogen of high food safety concern, surveillance of *Salmonella* in production systems like beef feedlots is essential. In recent years, dairy industry has adopted beef semen to produce beef-on-dairy calves. These calves are advantageous over traditional beef calves due to superior quality in marbling of meat, good growth performance and higher dressing percentage of carcass. However, incidence of gastro-intestinal tract pathogens like *Salmonella* could be substantially high in these calves, owing to the feeding and management practices followed in raising these cattle. Currently, there are no studies on the prevalence of *Salmonella* in beef-on-dairy cross cattle. Thus, our objectives were to conduct a comprehensive analysis of feeding and management practices, including data on morbidity and mortality, from birth to harvest to determine their associations with *Salmonella* prevalence in feces and lymph nodes.

A total of 529 pen floor fecal samples were collected randomly from feedlots in 5 different states across US. Data on feeding and management practices were also collected from ranches and grower yards using structured questionnaires. The survey included questions on diet composition, feeding frequency, water quality, and housing conditions. Survey data were also collected on specific management practices like 'one-time capacity for bottle calves and post-weaned calves. Additionally, data on health management protocols like antimicrobial use and vaccination schedule, and the influence of environmental factors, such as warmer climates, were also collected. *Salmonella* isolation and identification were done by culture method, agglutination and PCR detection. All statistical analyses were performed using R version 4.3.1. Responses to a survey questionnaire related to farm management practices were analyzed by LASSO logistic regression. A logistic regression model was fitted with *Salmonella* prevalence as the response variable and the main and interaction effects between production stage and State as predictors.

The overall prevalence of *S. enterica* in fecal samples was found to be 14.5% (77/529), with calves and growers having prevalence rate of 7.3% (22/303) and 24.33% (55/226), respectively. Among the five states, Kansas (8.7%) and Texas (62.1%) had high prevalence of *Salmonella* among calves and growers respectively. Similarly, Texas had the highest cumulative *Salmonella* prevalence (23.58%)

across all five states. However, states like Colorado (5%) and Nebraska (2.5%) showed very low *Salmonella* prevalence among calves. No positive *Salmonella* isolates were observed in Indiana among growers. Interestingly, odds of *Salmonella* prevalence were found to be significantly associated ($P < 0.001$) with geographical region and production stage. Four different management practices were also shown to potentially affect the prevalence of *Salmonella* in beef-on-dairy cattle. Our study provides valuable insights into the geographical and age-related variations in the prevalence of *Salmonella enterica* among beef-dairy cross cattle. These findings emphasize the need for region-specific control strategies in US to mitigate spread of *Salmonella* across food chain. Further studies are directed molecular characterization to understand ecology and public health implications of *Salmonella.*

**Presenter:** Darby Toth

**Title:** Use of Abdominal Ultrasound in Patient Selection for Laparoscopic-Assisted Gastrointestinal Foreign Body Removal.

**Authors:** Darby Toth[1], David Upchurch[1*], DVM, MS, DACVS-SA Mackenzie Hallman[1], DVM, DACVR, DVM, Nicky Cassel[1], BSc, BVSc, MMedVet, DECVDI

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**Keywords:** Laparoscopic-assisted; foreign body; abdominal ultrasound

## Abstract

Objective: To determine the accuracy of abdominal ultrasound in determining the suitability of a patient to undergo laparoscopic-assisted gastrointestinal foreign body removal. Study Design: Prospective longitudinal study. Animals: Client-owned dogs (30) that underwent surgical removal of gastrointestinal foreign bodies (31). Methods: Dogs diagnosed with or suspected to have a gastrointestinal foreign body obstruction underwent a preoperative abdominal ultrasound performed by a board-certified radiologist. Information regarding foreign body type, location within the gastrointestinal tract, size, and shape were recorded, as well as documentation of the presence or absence of peritoneal fluid, pneumoperitoneum, or gastrointestinal mural changes. This information was used to predict the success or failure of laparoscopic-assisted foreign body removal using preset parameters. Laparoscopic-assisted foreign body removal was then attempted in all patients. Surgical findings were compared to preoperative ultrasound findings. Results: Abdominal ultrasound was accurate at determining the type, location, and shape of gastrointestinal foreign bodies, with accuracies of 96.8%, 74.2%, and 93.5% respectively. Abdominal ultrasound was inaccurate at determining gastrointestinal foreign body size and the presence of abdominal adhesions. Laparoscopic-assisted surgery was successful in 17/30 (56.7%) of cases, including 2/7 (28.6%) of linear, 14/23 (60.9%) non-linear, and 1/1 (100%) gastric foreign bodies. Conclusion: Preoperative abdominal ultrasonography is a useful diagnostic to aid in determining the suitability of a patient to undergo laparoscopic-assisted foreign body removal.

**Presenter:** Cheyenne Town

**Title:** Are you bothered? Using Accelerometers for Measuring Fly Worry in Horses

**Authors:** Cheyenne Town, Victoria Pickens[2], PhD student, Cassandra Olds[2*], PhD, MS

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**Keywords:** Horse; equine; fly; accelerometer

## Abstract

Fly worry is a group of stereotypical avoidance behaviors demonstrated by animals in response to fly nuisance. The most commonly seen behaviors in horses are skin twitches, head tossing, leg stamps and tail swishes. Accurately measuring fly worry is important to assess the welfare and wellbeing of an animal in addition to the effectiveness of fly control. Traditionally fly worry has been measured by human counting of fly worry events, but this is unreliable and open to bias. We hypothesize that accelerometers can be used to more accurately measure fly worry behavior in horses. Fly worry and natural gaits were measured using accelerometers attached to the head, legs and tail of 3 horses. Acceleration of the body part was measured on the x, y and z axis and correlated with video footage to confirm behaviors being documented. Accelerometers attached to the tail were most able to distinguish between movement (walk, trot or canter) and fly worry. Horses under the same fly pressure vary in the intensity and direction of their fly worry tail swishes, indicating individual sensitivity to fly worry. Fly worry events significantly decreased after fly control intervention (fly sheets and boots) suggesting that this method can be used in studies developing and evaluating fly control in horses.
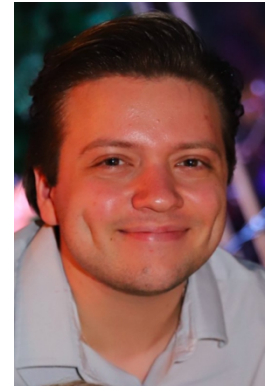
**Presenter:** Ilya Verekhman

**Title:** Haemosporidian Parasites in Kansas Birds and an Investigation into the Biting Midge Vector

**Authors:** Ilya Verekhman[1]*, Caitlin E. Taylor[2], Phillip Shults[2], PhD

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**Keywords:** Culicoides; Haemoproteus; Vector; Turkey

## Abstract

Outbreaks of avian malaria can cause significant losses to bird populations impacting both wild and captive species. This disease is caused by blood parasites from the genera Plasmodium and Haemoproteus; however, the specific insect species involved in the transmission of these parasites from bird to bird remains poorly understood. This study aimed to demonstrate that the biting midge, Culicoides haematopotus, serves as a primary vector for Haemoproteus. To investigate this, traps were set in various locations around Manhattan, Kansas, during the summers of 2023 and 2024 to collect wild Culicoides. Blood samples from turkeys were obtained through collaboration with local hunters. Sanger sequencing was used to detect the presence of parasites in all samples and identify what avian species the midges were feeding on. Histological methods were used to examine turkey red blood cells and Culicoides salivary glands. Nearly a third of avian blood tested from midges belonged to turkeys, and almost half of those samples tested positive for Haemoproteus. Infections were found exclusively in C. haematopotus. All eight turkey blood samples from hunters tested positive for Haemoproteus, with three showing coinfections with different parasite species. Genetic analysis showed a 99.6-100.0% sequence identity match for parasites found in C. haematopotus samples to those collected from turkeys. Histological evaluation revealed sporozoites (the infective stage) in the salivary glands of this midge species. These findings establish a clear link between Culicoides haematopotus as a vector for Haemoproteus, highlighting the need for proactive research to prevent potential disease outbreaks.

**Presenter:** Brian Wolfe

**Title:** Sex Differences In Influenza Vaccine-Induced Immunity And Protection In Mice With Obesity

**Authors:** Brian Wolfe[1], BS, Saurav Pantha[1], DVM, Shristy Magar[1], DVM, Santosh Dhakal[1]*, DVM, MS, PhD

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**Keywords:** immune response; sex difference; obesity; vaccination

## Abstract

OBJECTIVES: Host-associated factors, including biological sex (i.e., male or female as determined by chromosomes, gonads, and sex steroids) and obesity, impact immune responses to influenza vaccines. Whether or not obesity impacts influenza virus vaccine responses in a sex-specific manner is not known. Our objectives were to investigate sex differences in influenza vaccine-induced immunity and protection in a mouse model of diet-induced obesity (DIO). METHODS: Five- to six-week-old male and female C57BL/6 mice were randomly assigned to either a high-fat diet (HFD, 60kcal% fat) or a control diet (10kcal% fat), and body mass was recorded weekly. Mice on HFD with body mass ≥20% than the average body mass of age- and sex-matched mice on the control diet were considered obese. Obese and non-obese male and female mice, obtained after a diet treatment for 12 weeks, were vaccinated with an inactivated A/California/04/2009 H1N1 vaccine (20µg in 40µL phosphate buffered saline) and boosted after 21 days post-vaccination (dpv). At 35 dpv, plasma samples were collected to measure antibody responses by enzyme-linked immunosorbent assay (ELISA) and virus-neutralizing assays. At 42 dpv, vaccinated mice were inoculated intranasally with a drift variant of the H1N1 virus (105 TCID50 in 30µL of Dulbecco's Modified Eagle Medium). Body mass was recorded daily for 21 days post-challenge (dpc) to determine disease severity and protection. Subsets of mice were euthanized at 35 dpv to quantify B cells in bone marrow by flow cytometry and at 3 dpc to collect lung samples to measure replicating virus titers. RESULTS: After 12 weeks of diet treatment, 100% of the male and 67% of female mice became obese. Males and females with obesity had significantly greater body mass, glucose intolerance, and body mass index than the non-obese controls ($p < 0.05$ in each case). At 35 dpv, IgG, IgG2c, and virus-neutralizing antibody (nAb) titers were higher in females than in male mice, irrespective of obesity. Importantly, males with obesity had the lowest levels of IgG, IgG2c, and nAb titers than the other groups. After the virus challenge, change in body mass was compared for 21 dpc. In agreement with the lowest levels of antibodies, vaccinated obese males were least protected as evidenced by higher absolute (i.e., in gm) and relative (i.e., percentage change from the baseline) body mass loss. Similarly, both obese and non-obese females with higher antibody titers cleared replicating viruses from the lungs within 3 dpc. While 75% (i.e., 3/4) of non-obese males cleared, none of the vaccinated obese males (i.e., 4/4) could clear replicating viruses from the lungs. Flow cytometry analysis of bone marrow-derived cells showed a similar frequency of memory B cells among the four groups. However, the frequency of plasma cells was significantly higher in female non-obese and obese mice compared with their male counterparts. CONCLUSION: Our data illustrate that antibody production after influenza vaccination is inferior in males with obesity and they are less protected from subsequent influenza virus challenge. This is likely mediated by the inefficiency of B cells to produce antibodies in obese males, which warrants further investigation.

# Phi Zeta RESEARCH DAY
## KANSAS STATE UNIVERSITY

**Presenter:** Dylan Wootton

**Title:** Baculovirus Expression of the VP-2 Protein From Epizootic Hemorrhagic Disease Virus Serotype 8

**Authors:** Dylan Wootton[1], Juergen A. Richt[2], DVM, PhD, Daniel W. Madden[2], DVM, Yonghai Li[2], DVM, MSc, DSc, Natasha N. Gaudreault[2], PhD, BS, Francesca Profeta[3], DVM, PhD, Alessio Lorusso[3], DVM

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**Keywords:** EHDV8; Baculovirus expression; Recombinant protein

## Abstract

Background: Epizootic hemorrhagic disease is an arthropod-transmitted disease that causes serious illness in domestic and wild ruminants, including white-tailed deer and cattle. The causative agent, Epizootic hemorrhagic disease virus (EHDV), is an Orbivirus with 8 distinct serotypes, determined by the heterogeneity of the viral VP-2 protein. Recently, EHDV serotype 8 emerged in northern Africa and southern and western Europe, where it has caused outbreaks in cattle with significant economic impact. There is currently no commercially available vaccine for EHDV-8. Methods: We expressed and purified a recombinant EHDV-8 VP-2 protein for potential use in diagnostics or vaccine development. For this purpose, a baculovirus expression vector system (BEVS) was used to generate the recombinant VP-2 protein. Recombinant VP-2 was expressed and purified from Sf9 insect cells and analyzed for reactivity with specific antibodies in serum from cattle experimentally infected with EHDV-8. Results: Our results show that the recombinant VP-2 protein displays specific reactivity with anti-EHDV-8 antibodies, indicating it is antigenically similar to wild-type EHDV-8 VP-2 protein. Conclusions: These results suggest that baculovirus expressed EHDV-8 VP-2 could have utility as a diagnostic reagent or vaccine antigen. Additional studies will be needed to assess the immunogenicity of the recombinant VP-2 in vivo.

**Presenter:** Alexandria Zabiegala

**Title:** Roles of PD-L1 in the Pathogenicity of Feline Infectious Peritonitis Virus

**Authors:** Alexandria Zabiegala[1], DVM, Yunjeong Kim[1], DVM, PhD, Kyeong-Ok Chang[1*], DVM, PhD

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**Keywords:** Feline coronaviruses; feline infectious peritonitis; Programmed cell death protein-ligand 1; persistent infection; pathogenicity

## Abstract

Introduction: Feline infectious peritonitis (FIP) is caused by FIP virus, a virulent form of feline coronavirus (FCoV). In some cats, initial enteric infection of feline enteric coronavirus (FECV) leads to virus mutations in virus spike protein (S), ORF3a and/or ORF7b, which allows infection of macrophages, and an impaired T cell response that plays a critical role in FIP development. Programmed cell death protein (PD-1) and its ligands (PD-L1 and L2) play crucial roles in immune responses as an immune checkpoint system. The PD-1 axis downregulates T cell response and is reported to be involved in immune evading mechanisms of various virus infections. However, the roles of the PD-1 axis in FIP development remain unknown. Methods: In this study, we utilized two distinct biotypes of FCoVs, FIPV-1174 and FECV-1683, to study the role of PD-1 axis as a potential mechanism for FIP development. Additional FIPV strain (Black) was also included in the study. The expressions of PD-L1 and PD-L2 were determined by real-time qRT-PCR and confocal microscopy after CRFK cells (feline kidney epithelial cells) or FCWF-4 cells (feline fetal macrophage cells) were infected with FIPV-1174 or FECV-1683. The PD-L1 overexpressing cells were generated by incubating with interferon-gamma, and the cells were infected with FIPV-1174 and viral replication was determined by real-time qRT-PCR. Additionally, various cell signaling pathways were investigated in cells infected with FIPV-1174 or FECV-1683. Results: Real-time qRT-PCR results and confocal study showed that FIPV-1174, but not FECV-1683, induced PD-L1 expression in both CRFK and FCWF-4 cells. The fold-increase in PD-L1 expression was markedly greater in FCWF-4 cells than CRFK cells. However, there was no difference in the replication of FIPV-1174 and FECV-168 in both cell lines. Infection of FCWF-4 cells with FIPV-Black strain also increased PD-L1 levels. The cell signaling profiling assays showed that FIPV-1174 increased NF-kB signaling, which is line with the previous reports that PD-L1 regulation is controlled via NF-kB signaling pathway. Conclusion: We conclude that the tested FIPV strains, but not FECV, increased PD-L1 levels. This elevated PD-L1 axis may lead to dampened T cell response to FIPV, allowing persistent infection in macrophages and development of FIP clinical signs.

**Presenter:** Qi Zhang

**Title:** Comparative Analysis of Proinflammatory Cytokines and Chemokines in Different Tissues following Influenza Infection in a Mouse Model of Obesity

**Authors:** Qi Zhang[1], BS, Saranya Vijayakumar[2], PhD, Brian Wolfe[2], BS, Saurav Pantha[2], DVM, Tawfik Aboellail[2], DVM, PhD, Santosh Dhakal[2]*, DVM, PhD

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**Keywords:** Inflammation; cytokines; chemokines; influenza; obesity

## Abstract

Background: Influenza A virus (IAV) primarily causes disease in the respiratory tract and obese hosts are at an increased risk of severe disease. IAV infection also can cause inflammatory changes in the extrapulmonary tissues and obesity could alter them. Proinflammatory cytokines and chemokines such as IL-6, IL-1β, TNFα, and MCP-1 increase in the lungs following IAV infection. In this project, our objective was to compare the expression of these key inflammatory markers in extrapulmonary tissues such as the spleen, kidney, liver, and inguinal adipose tissue (IAT) in a mouse model of obesity. Methods: Diet-induced obese or non-obese mice were obtained after a high-fat or control diet treatment for 14 weeks. Animals were infected either with a lethal dose (i.e., 103 TCID50) of a mouse-adapted 2009 pandemic H1N1 IAV or with medium only. After the 3 days post-infection (dpi), mice were euthanized, lungs, spleen, liver, kidney, and inguinal adipose tissues were collected, and cytokine responses were measured by multiplex assay in the lungs or qPCR in other tissues. Results: Obese mice had significantly greater body mass, IAT, glucose intolerance, and higher leptin concentration. At 3 dpi, virus-inoculated mice, irrespective of obesity status, suffered from lung inflammation and had 6 to 7 log10 TCID50/mL of infectious virus in the lungs. IAV-infected mice had significantly increased levels of IL-6, IL-1β, TNFα, and MCP-1 compared to medium-inoculated mice in the lungs. Compared to the virus-infected non-obese mice, the fold change in the virus-infected obese mice showed a greater trend (p=0.1) for IL-6 and significantly lower levels for MCP-1. In spleen, the IAV-infected mice had increased levels of TNFα compared to the medium-inoculated mice. Compared to the virus-infected non-obese mice, the fold change in the virus-infected obese mice showed a greater trend for IL-6 (p=0.06), IL-1β (p=0.1), and MCP-1 (p=0.1) in spleen. In kidney, significantly increased levels of IL-6, IL-1β, TNFα, and MCP-1 were observed in IAV-infected mice compared to medium-inoculated mice, and the fold change in the virus-infected obese mice showed a significant decrease for TNFα and a greater trend for IL-6 (p=0.06) compared to the virus-infected mice. In the liver, there were no significant changes observed in the IAV-infected mice compared to medium-inoculated mice. However, compared to the virus-infected non-obese mice, the fold change in the virus-infected obese mice showed greater trend for IL-6 (p=0.1) and TNFα (p=0.1). In IAT, IAV-infected mice had significantly increased levels of IL-6 and IL-1β compared to medium-inoculated mice but the fold change in the virus-infected obese mice showed a significantly decreased level for MCP-1 compared to the virus-infected non-obese mice. Conclusion: Relative expression of IL-6 was higher in virus-infected obese mice in the lungs, spleen, kidney, and liver, while the expression of MCP-1 was lower in lungs and IAT. In summary, high-dose IAV infection alters proinflammatory cytokines and chemokine responses in non-obese and obese mice in tissue specific manner.

**Presenter:** Jordana Augusta Rolim Zimmermann

**Title:** Automated Machine Learning and Facial Imaging for Feedyard Cattle Outcome Prediction

**Authors:** Jordana Zimmermann[1], MV, MS, Luis Feitoza[1], DVM, PAS, Ph.D., Brad White[1], DVM, MS, Eduarda Bortoluzzi[1*], MV, Ph.D.,

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**Keywords:** Automated machine learning; bovine respiratory disease; facial image; feedyard cattle; predictive model

## Abstract

Background Machine learning (ML) has shown promise in predicting Bovine Respiratory Disease (BRD) outcomes in feedyard cattle. While facial imaging has been utilized in other species, its application in predicting cattle outcomes at treatment remains unexplored. Objective This study evaluated the potential of facial images taken at BRD treatment to predict feedyard cattle outcomes: Recovered or Did-not-finish (DNF). Methods Facial images (n=923) were collected from commercial feedyard cattle during a cross-sectional observational study (July–December 2023). Outcomes were determined 60 days post-enrollment as Recovered (alive at day 60) or DNF (died or culled within 60 days). Images were analyzed using Microsoft Azure Machine Learning Studio's automated ML feature for multi-class classification. Results After excluding 155 images for duplication or poor quality, 768 images were analyzed, with 71% labeled Recovered (n=547) and 29% DNF (n=221). 'ResNet50' algorithm was identified as the best-performing model. Sensitivity, specificity, positive predictive value, and negative predictive value were 54%, 82%, 57%, and 79%, respectively. Conclusions Facial imaging-based models show potential for predicting cattle outcomes. Combining these models with other diagnostic tools could improve management strategies in feedyard operations.