

2024 VetMed Research Scholars Abstracts

Novel biocide treatment of experimental digital dermatitis transmission from sheep to cattle

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Digital Dermatitis (DD) is the most significant cause of lameness in cattle. The etiology of DD is unknown, but it is associated with *Treponema* spp.. Injectable antibiotics have limited effectiveness in this skin disease. Early lesions can be controlled by copper sulfate or formalin footbaths; however, these chemicals have human health and environmental concerns in addition to not healing or even exasperating severe lesions. The frequency of footbath use needed for effective prevention works in dairy parlors but is not practical in the beef industry. Environmentally friendly alternatives, effective at treating severe lesions are needed. Previous models used cattle to cattle DD transmission between yearling calves. This study focuses on adult cattle inoculated from sheep passaged DD lesion homogenate and treated with novel hydrazone biocide.

The study was conducted over a four-week period, with five adult cattle. The cattle's hind feet were fitted with wraps for maceration, then inoculated with sheep passaged lesion homogenate. Wraps were changed and lesions documented weekly. The animals receive daily medication (oral NSAIDS) to mitigate lameness or pain. In week three, the biocide treatment was applied as a pour over wash, stimulating a footbath, with 1 % (w/v) active solution three times, approximately 4 days apart to the right hind hoof. The left hoof was untreated as a control. At week four, topical paste with the biocide (2% w/v) was applied, and 3 days later, lesion reduction was documented. The feet treated with the novel biocide showed a decrease in lesion size after footbath treatments, lesion size decreased by 39%. After paste administration, lesions decreased by 49%. Overall, lesions shrunk by a total of 67%. This study shows the effectiveness of the hydrazone biocide for treatment of severe DD in cattle. Preliminary data shows that hydrazone biocide greatly decreases DD lesions and could be an alternative treatment to antibiotics and copper sulfate currently in use.

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Quantitative analysis of mesenchymal stem cells and exosomes in dogs with naturally occurring osteoarthritis secondary to cranial cruciate ligament rupture

Amy Bodine, Barbara Kaplan, Trey Howell, Michael Jaffe

Osteoarthritis (OA) is a multifactorial joint disorder and common sequela to cranial cruciate ligament injury with progressive loss of articular cartilage. Extracellular vesicles (EVs), like exosomes, are membrane-bound vesicles released from mesenchymal stem cells that carry cellular cargo crucial for cell-to-cell communication. Exosomes contain macromolecules such as lipids, proteins, messenger RNA (mRNA), and micro RNAs (miRNA). These release their genomic signaling cargo into cells to provide genetic codes for producing specific proteins in the intercellular communication network that have a role in cartilage regeneration through immunomodulatory, immunosuppressive, anti-apoptotic, and chondrogenic effects. The infrapatellar fat pad (IFP) is an intra-articular, extra synovial structure within the stifle joint and a rich source of mesenchymal stem cells (MSCs). Tissues like the IFP and synovial fluid are commonly removed during cruciate repair surgeries. We hypothesize that dogs with naturally occurring osteoarthritis secondary to a ruptured cranial cruciate ligament will have a greater concentration of MSCs and exosomes in their infrapatellar fat pad, synovial fluid, and synovial membrane tissue than dogs without stifle pathology. Through flow cytometry and the use of fluorescent antibodies, we were able to quantify the percentage of MSCs and exosomes. We found that the average percentage of MSCs was increased significantly in the clinical samples of synovial fluid, synovial membrane, and infrapatellar fat pad compared to the control samples from unaffected dogs, while the exosome content of the clinical samples remained similar, only increasing slightly in the synovial membrane, compared

to the control samples. This unexpected finding implies the importance of protecting and preserving the IFP and synovial fluid to preserve MSC concentration useful in the reduction of inflammation in osteoarthritic patients.

Student Support: Mississippi State University College of Veterinary Medicine

Comparative Wound Healing in Wild-type and PXR Knockout Mice Using Excisional and Pressure-Induced Models

Kirkland Burkett and George (Trey) Howell, III

Previous studies have examined the role of the pregnane X receptor (PXR) in drug interactions and xenobiotic metabolism but to a lesser extent in the context of wound healing. The PXR has been shown to have both anti and pro-inflammatory properties, with a noted pro-inflammatory tone in keratinocytes. Thus, there is a possibility that activation of the PXR could negatively impact the skin barrier. The present study is a step toward understanding the PXR's role in wound healing. Our study examines the impact of PXR in non-diabetic mice to establish a baseline of the function in the absence of metabolic dysfunction. Excisional and pressure-induced wounding models were used in wild-type and PXR knockout (PXRKO) mice to replicate acute and chronic wound development. Our overall hypothesis is that the activation of the PXR by potential endogenous ligands will be detrimental to the wound-healing process, which will occur in a sex-dependent manner. The male and female PXRKO mice healed quicker in the excisional cohorts than the wild-type (WT) mice. There was no statistical significance between the healing of males and females. As for the pressure-induced cohorts, the male WT mice healed quicker than the PXR KO mice. Between sexes, female WT animals with pressure wounds tend to heal more slowly at the beginning of wound resolution. In conclusion, it appears PXR plays a significant role in excisional wound healing in both male and female mice. However, it appears that deletion of PXR negatively affects pressure wound healing in PXR KO males with minimal effects in female pressure wound healing.

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Studying the Growth and Development of Weaned Spanish Goats Using Fecal Microbiome and Parasitology Criteria

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There are nearly two million goats raised for meat in the US with Mississippi alone experiencing an increase by 11% from 2023 to 2024. Spanish goats are among the most popular meat goat breeds and their descriptions are notably underrepresented in research, especially during the pre and post weaning period. Fecal microbiome, parasite levels, and phenotypic indicators are useful tools to predict health and performance. To study this we collected feces, rectal swabs, and phenotypic data from nine Spanish goats at four different time points: one week before weaning and 2, 4, and 8 weeks after weaning. These goats were allowed *ad-libitum* grazing of mainly Bahiagrass along with supplementation of medicated complete feed. SAS 9.4 was used to compare the weight to the fixed effects of week, sex, and parasite levels. Week was the only significant source of variation on weight demonstrating the normal growth of the animals despite fluctuating parasite levels. Fecal microbiota composition highlighted *Cutibacterium* and *Campylobacter sp RM12175* as the most abundant bacterial species during pre- and post-weaning stages with notable trends in *Campylobacter sp RM12175* and *Escherichia coli*. Additionally, the relative abundances of bacterial species were identified, revealing an association with body weight including negative correlations for *Victivallis* and *Veillonella ratti*, and a positive correlation for *Anaerostipes hadrus*. In conclusion, neither parasite levels nor sex significantly impacted body weight.

However, fecal microbiome data shows correlations between certain bacterial species and body weight. Further research into this goat breed could enhance productivity and promote sustainable practices among meat goat producers.

Student Support: Boehringer Ingelheim Veterinary Scholars Program and Mississippi State College of Veterinary Medicine

Influence of exposure time and repetitive doses in an *Edwardsiella ictaluri* challenge model

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Farm-raised catfish is the largest sector of the US Aquaculture Industry. Enteric Septicemia of Catfish (ESC) caused by *Edwardsiella ictaluri* (Hawke et al. 1981), is one of the most economically damaging diseases faced by commercial catfish producers (USDA 2003). The effects of *E. ictaluri* have been extensively studied using a basic challenge model, but the impact of exposure time or repeated exposures on catfish mortality remains unknown. This study aimed to determine whether increased exposure time or repeat exposures could compensate for suboptimal bacterial growth to save researchers significant time and effort. Channel catfish fingerlings were distributed (20 fish/aquaria; 5 aquaria/treatment) and supplied with flow-through groundwater with supplemental aeration. An *E. ictaluri* isolate, (S97-773) was cultured to achieve a target dose. During bath immersions, water flow was suspended, *E. ictaluri* broth culture was added, and water flow resumed after the allotted time and monitored for 28 days. Trial one immersed catfish for 15, 30, 60, or 120 minutes to determine the influence of exposure time on mortality. Upon analysis, there was no statistical significance in mortality rates among adjacent groups. However, a notable difference in mortality rates emerged between longer time intervals (30 minutes versus 120 minutes). In the second trial, catfish were challenged for 30 minutes for 1, 2, and 3 days. This trial demonstrated that increased exposures correlated with higher mortality rates. This will revolutionize the challenge models used to study channel catfish mortality caused by *E. ictaluri* by enhancing research productivity and minimizing resource expenditure.

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Cross-sectional study to determine factors related to gastrointestinal parasite prevalence in cow-calf herds

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The objective of this study was to test individual and herd-level characteristics for an association with the prevalence and concentration of gastrointestinal (GI) parasites in Mississippi beef cow-calf herds. Fecal samples were collected from 1,666 beef cows across 33 herds in 18 Mississippi counties. Surveys were used to collect data on individual and herd-level risk factors. The modified McMaster's technique was used to estimate strongyle-type fecal eggs per gram (FEPG). Linear regression mixed models were employed to test the effect of age on FEPG. A logistic regression generalized linear mixed model was used to test herd-level factors for association with GI parasite prevalence. Herd was considered a random variable in all models. Multivariable models were assembled by manual forward variable selection. No eggs were detected in 74% of samples. Age was related to individual animal FEPG (≤ 3 yrs: -1.96, 95% C.I.= -25.5, 21.6; 4-5 yr: -6.63, 95% C.I.= -29.2, 15.9; 6-8 yr: -24.4, 95% C.I.= -44.9, -3.84; compared to ≥ 9 yr). Factors associated with proportion of cows infected with GI parasites include oral dewormer use (OR= 0.6, 95% C.I.= 0.5-0.9), summer calving (OR= 0.4, 95% C.I.= 0.3-0.6), observing lethargy/weakness (OR= 2.4, 95% C.I.= 1.7-3.6), season of sample collection (Spring: OR= 0.5, 95% C.I.= 0.3-0.8; Summer: OR= 0.4, 95% C.I.= 0.2-0.7; Fall: OR= 0.6, 95% C.I.= 0.4-0.9;

compared to Winter), purchased herd bull (OR= 0.5, 95% C.I.= 0.4-0.8), and injectable dewormer use (OR= 0.5, 95% C.I.= 0.3-0.8). In conclusion, GI parasite infections were rare in this study and their presence was associated with deworming practices, season, husbandry practices, and age.

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Search for an effective therapy to treat traumatic brain injury

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Traumatic brain injury (TBI) is one of the leading causes of mortality in the United States each year. TBI is the result of a violent force or jolt that damages the brain. The damage can persist for weeks to years even in mild cases, with long term effects correlated with the secondary immune response. The timing of treatment following a brain injury is vital for recovery, and by initiating treatment earlier, the secondary immune response may be lessened. The purpose of this research project is to develop a therapeutic intranasal spray that can be rapidly administered and will reduce the level of brain damage following TBI. Previously, we demonstrated that repeated administration of our novel therapeutic reduces the level of damage in the brain as measured days later following impact. To initiate testing the effectiveness of a single administration of the therapeutic on reducing TBI-related effects, the effect of different levels of impacts on motor activity was determined. Adult male rats were subjected to impact levels of either 1.0J, 1.5J, 2.0J, or 2.5J. Motor activity was measured 4 hr after impact. Lower impact levels reduced activity, whereas higher levels increased activity. While control animals exhibited a decreased activity over time, impacted animals exhibited a flatter pattern of activity. Intranasal administration of the therapeutic to control rats slightly altered the pattern of activity. Intranasal administration of the therapeutic to rats 1 hour following 2.0J impact greatly improved behavioral performance as compared to 2.0J impact alone. These data suggest that intranasal administration of the novel therapeutic following TBI has positive effects on TBI disrupted behavior.

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Evaluation of Bovine Respiratory Syncytial Virus-Specific IgE Concentrations Within Exposed Cattle

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Some outbreak cases of Bovine Respiratory Syncytial Virus (BRSV) can come with severe clinical signs including dyspnea, nasal discharge, and fever, causing high morbidity rates amongst young cattle. It has been recognized that increased BRSV-specific IgE levels may have a correlation to severity of BRSV disease, although there is lack of research in the field. The IgE antibody isotype is known to bind with mast cells, causing a cascade of crosslinking to epitope-specific antigens on the pathogen and mast cell degranulation of inflammatory mediators that can exacerbate disease. Although little is understood, IgE may be upregulated during infection due to the virus's ability to stimulate an IgE-mediated response, and this process may be multifactorial. We hypothesize that cattle from a BRSV outbreak characterized by severe clinical signs will present higher levels of BRSV-specific IgE than cattle vaccinated with BRSV that experienced no apparent clinical disease. Development of a BRSV-specific IgE ELISA through evaluation of the monoclonal and secondary antibody dilutions was critical in evaluating BRSV-specific IgE levels in serum. The E5 monoclonal at 1:200 was most effective at binding bovine IgE. Additionally, the BioRad secondary antibody at 1:2000 showed optimal detection. The apparently healthy vaccinated cattle displayed significantly higher BRSV-specific IgE values than the severely diseased outbreak samples under the optimized ELISA conditions. Therefore, my

hypothesis that the outbreak cattle would present higher BRSV-specific IgE titers was rejected based on these findings, but there is still much to understand about bovine IgE's response patterns to BRSV infection to better determine its role.

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Analyzing hematological parameters from Kemp's ridley sea turtles as indicators of prognosis and length of rehabilitation

Savannah Johnston, Isaac Jumper, Jill Hudnall, Theresa Madrigal, Debra Moore, Beth Peterman, and Mark Lawrence

Kemp's ridley sea turtles (KRST) are classified as an endangered species, so rehabilitation and release of injured or moribund KRST are critical to ensuring restoration of the species. Serum chemistry and complete blood count (CBC) are valuable indicators of health, providing insights into health status, stress, and immune function. Through the Gulf Coast Aquatic Health Program, MSUCVM has supported rehab and release of KRST since 2017; these included KRST stranded in Mississippi (MS) and KRST that stranded from cold stunning in Massachusetts (MA). We analyzed anthropometric measurements and hematological parameters of KRST obtained at initial intake, during rehab, and before release. Paired T-Tests were used to assess the impact of state of intake (MA or MS) on blood parameters measured at intake and how these parameters differ between intake vs release. Linear mixed models were used to assess the impact of intake state (MA or MS) on 1) length of turtle, 2) weight of turtle, 3) ratio of length to weight. MA KRST were smaller in length and weight than MS KRST, but also their length-to-weight ratio was significantly increased, indicating a decreased Body Conditioning Index. Because of their poorer BCI, rehab for MA KRST could require more time compared to MS KRST. CBC values for both MA and MS KRST were within normal limits. However, MA KRST are often treated for pneumonia, so the lack of inflammatory response detectable on the CBC is noteworthy. MA KRST also had different serum chemistry parameters indicative of renal function, which could be associated with dehydration and muscle wasting. By comparing hematological parameters, we detected disparities that can inform effective clinical management of KRST during rehab.

Student Support: Mississippi State University College of Veterinary Medicine

Equine Hock Model Fabrication and Validation

Jubach, Jake and Nabors, Ben

The equine industry is afflicted with costs associated with lameness estimated to be between \$1.2 and \$1.8 million per year. Osteoarthritis in joints is a common cause of lameness, often treated by injecting medication directly into a joint space. Mastering arthrocentesis is crucial for veterinarians to provide quality care. Arthrocentesis is essential not only for veterinarians working with high-performance horses, it is just as important for all practitioners to ensure consistent care for all equine patients. Arthrocentesis is also a valuable tool for other treatment purposes; flushing joints, obtaining joint fluid samples, injecting medications like antibiotics, and conducting diagnostic lameness evaluations. Properly treating infections or lacerations near joint spaces can significantly reduce mortality rates and improve lameness recovery. This study aimed to design, create, and validate an equine hock model to enhance education on equine arthrocentesis. The hock was chosen to create a model because it has three joint sites with varying degrees of difficulty to inject, the tibiotarsal (tarsocrural) joint, distal intertarsal joint, and tarsometatarsal joint. The use of a model to allow students to become comfortable with the procedure followed by administration on live horses is a program that can be implemented to improve the confidence of students and new veterinarians and increase quality of care for every

equine patient. The model developed in this study can also be used to educate and train veterinarians with limited experience, increasing confidence in their abilities. Providing veterinarians and students with this tool will increase access for all equine patients to receive the highest quality treatments.

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Development of a vaccine providing protective mucosal immunity against invasive pneumococcal infection

Katelyn Kahler, Justin A Thornton, Chayoung Kim, Joo Youn Park, Keun Seok Seo

Streptococcus pneumoniae is a major cause of pneumonia, sepsis, and meningitis. Although capsular polysaccharide conjugate vaccines provide successful protection, the increasing incidence of capsular serotypes without vaccine coverage demands development of a novel vaccine independent from capsular polysaccharides. Previous studies in our laboratory showed that a 67 kDa *S. aureus* protein (MAP) induced a robust IgA response in human sera. We hypothesized that vaccination of pneumococcal attachment proteins combined with MAP as a vaccine adjuvant will induce a protective mucosal IgA response against invasive pneumococcal infection. C57BL/6 mice immunized with MAP showed significantly higher IgA titers in the bronchoalveolar lavage (BAL) than PBS control mice. Cytokine analysis showed that MAP induced a significantly higher expression of IL-2, IFN- γ , and IL-17A, which are required for T cell proliferation and IgA isotype switching and secretion. C57BL/6 mice immunized with choline binding protein M (CbpM) and MAP showed significantly higher CbpM-specific IgA response compared to animals immunized with CbpM alone. When challenged with *S. pneumoniae* infection, mice vaccinated with both CbpM and MAP had a survival rate of 75% while those vaccinated with CbpM or MAP alone had a 25% survival rate. These data provide groundwork for the use of Cbps as a universal pneumococcal vaccine that does not rely on capsular serotype for protection. Furthermore, the use of MAP as a vaccine adjuvant can be applied to mucosal vaccine production against a variety of pathogens, increasing efficacy and research potential for current and future public health efforts.

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The Diagnostic Utility of Post-Cough Radiographs at Identifying Tracheal Collapse in Dogs

Madeleine Lamb, Marc Seitz, and Alison M Lee

Tracheal collapse in dogs involves the softening of tracheal cartilage causing tracheal narrowing or collapse during respiration with clinical signs ranging from a mild cough to respiratory distress. Tracheal fluoroscopy is the current imaging gold standard for diagnosis because it evaluates the airways for dynamic change during normal respiration and forceful expiration via an induced cough. Thoracic radiographs are often the first imaging step used due to their availability and cost; however, they tend to underestimate the frequency of collapse since they are a static image in time. This prospective observational study evaluated the diagnostic utility of post-cough radiographs compared to standard 3-view thoracic radiographs in diagnosing tracheal collapse. Thirty-one dogs received 3-view thoracic radiographs, additional right and left lateral radiographs after inducing a cough, and tracheal fluoroscopy. Two board-certified radiologists and one veterinary student evaluated all projections for evidence of collapse. Using fluoroscopy as the control, sensitivity, specificity, PPV, and NPV were calculated for post-cough and 3-view thoracic radiographs. The specificity and PPVs for both radiograph series were the same, but post-cough radiographs exhibited a 21% higher sensitivity and a 17% higher NPV. McNemar's test compared the sensitivities to determine a p-value of 0.13. While the p-value does

not indicate significance, these results may represent a type II error as pre-study power analysis revealed an ideal sample size of 60 patients. In summary, these results show that post-cough radiographs may help diagnose tracheal collapse in patients that could be misdiagnosed as normal when fluoroscopy is unavailable.

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Understanding radiographic and clinical presentations of osteomyelitis in cold-stunned Kemp's ridley turtles

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Osteomyelitis is a bone disease of bacterial or fungal origin introduced to sea turtles by aspiration of water or traumatic injury. The development of osteomyelitis and effects on the immune system could also be impacted by cold-stunning events. While osteomyelitis is a known disease, data on the radiographic and clinical presentation in cold-stunned sea turtles are currently lacking. The purpose of this research is to describe the radiographic and clinical presentation of osteomyelitis in cold-stunned Kemp's ridley sea turtles. The study population consisted of 30 cold-stunned Kemp's ridley sea turtles that were transferred from Massachusetts to the Institute of Marine Mammal Studies in Mississippi in December 2023 for rehabilitation under care of Global Center for Aquatic Health and Food Security veterinarians. Upon arrival, each turtle was examined and received radiographic imaging, which continued monthly to monitor their condition. Behavior and clinical signs were also noted based on daily observation of the rehabilitating population. Results showed that none of the turtles initially presented with evidence of osteomyelitis, but 12 of 26 turtles (46%) developed the disease two months after intake. This progressed to 15 of 23 (65%) turtles being affected three months after intake. Activity levels were also found to gradually increase during the rehabilitation period. Since no significant clinical signs were found, the clinical presentation of this population can be attributed to comorbidities, such as pneumonia. Based on the results of this research, the radiographic and clinical presentation of osteomyelitis can be better understood, which can assist rehabilitation facilities in diagnosing osteomyelitis.

Student Support - Mississippi State University College of Veterinary Medicine

Using gross and radiographic images to quantify changes in the equine digit by manipulating shoe thickness

Ava Powell and Ben Nabors

Hoof balance in the equine digit is sought after by veterinarians and farriers alike, with 90% of lameness happening from the carpus down and confirmation being a major contributing factor to this ailment. However, farrier practices are currently lacking the data to determine the average change in angle a given type of horseshoe may provide. With the use of therapeutic shoeing and radiographs, farriers and veterinarians work in tandem to recommend and perform shoeing procedures. In this study, farrier procedures are performed with gross and radiographic evaluation. From each image, the angles of the pastern and the distal phalanx (P3) are measured. Images were analyzed for each following technique: pre-trim, trim, shod, 1 cm block shoe, 1.5 cm block shoe, 2 cm block shoe, 1 cm shoe with a 0.5 cm height wedge, 0.5 cm height wedge, and finally a 1 cm wedge. By using the following methods, gross images are compared to radiographs to evaluate the differences and similarities. The techniques are evaluated to determine the level of change that is possible for angles of the pastern and P3 when thickness is changed across the whole hoof, or when thickness tapers down from heel to toe. In an experiment that gathered 288 angles in total, the pastern had the greatest level of predictability

overall between gross and radiographic images. The pastern exhibited a decreased angle as hoof wall thickness increased. The angle of P3 increased consistently as hoof wall thickness increased. Determining that the pastern and P3 change with hoof height, and determining when gross and radiographic images are most consistent allows the farrier and veterinarian to rely on and formulate a plan for the use that has been previously undefined.

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Characterization of cannabinoids and prednisolone on IL-6, IL-8, & IFN-g in healthy and osteoarthritic canine immune cells

Peter Spoelker, John Thomason, Michael Jaffe, and Barbara Kaplan

Chemicals from cannabinoids, such as cannabidiol (CBD) and delta-9-tetrahydrocannabinol (THC), have been shown to exhibit immune suppressive and anti-inflammatory properties. Specifically, CBD displays cytotoxicity against various types of human cancer cell lines, and CBD and THC decreases lymphocyte proliferation and cytokine production. Previous studies in our laboratory indicate that canine peripheral blood mononuclear cells (PBMCs) treated with a steroid, dexamethasone, produced less IFN-g. Additionally, this effect was enhanced when combined with CBD, THC, or both. This suggests that cannabinoids can provide steroid sparing effects for immunosuppression. Based on these observations, we hypothesized that a combination of cannabinoids and prednisolone will inhibit IL-6, IL-8, and IFN-g in PBMCs from healthy and osteoarthritic dogs. Whole blood samples were collected from healthy Treeing Walker Coonhounds and mixed breed osteoarthritic patients. The PBMCs were isolated from the buffy coat layer of a Percoll gradient and seeded into culture plates. Then, they were treated with a cannabinoid (CBD or THC), prednisolone, or vehicle (0.02% or 0.04% DMSO). After 30 min, they were stimulated with P/I (PMA and ionomycin) and left to incubate for 48 hr at 37° C. ELISA assays were performed to quantify the amount of IL-6, IL-8, and IFN-g produced from the supernatant samples of each dog. Overall, the studies showed that IFN-g was a sensitive target of suppression by CBD, followed by IL-6 which displayed less inhibition. Regardless of health status, PBMCs produced high levels of IL-8 even in the absence of stimulation. Despite cannabinoids providing steroid sparing effects to dexamethasone for immunosuppression, their benefit with prednisolone was not as obvious.

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Evaluation of cephalosporin and β -lactamase inhibitor antibiotics as synergistic, carbapenem-sparing therapeutics for ESBL infections in veterinary species

Rachel Strom, Khadija Ferdous, Joo Youn Park, Keun Seok Seo, Cooper Brookshire

Extended Spectrum β -Lactamases (ESBLs) produced by Gram-negative bacteria confer resistance to many common antibiotics, presenting significant therapeutic challenges in veterinary medicine and public health. The rise of ESBLs in Enterobacterales often necessitates the use of antibiotics of last resort, such as carbapenems. The use of carbapenems is associated with development of Carbapenem-resistant Enterobacterales (CRE), which are associated with high rates of mortality and are an urgent public health concern. This study aims to evaluate carbapenem-sparing treatment options for veterinary ESBL infections by testing synergistic combinations of cephalosporins and β -lactamase inhibitors against ESBL-producing bacteria. Clinical ESBL isolates from veterinary patients underwent a double-disk diffusion test to compare growth inhibition by a cephalosporin alone versus the same cephalosporin with a β -lactamase inhibitor. Of the 195 isolates evaluated, 95 were ESBLs and 5 were CREs. 65% of cefpodoxime-resistant ESBLs became susceptible or intermediate

with the addition of amoxicillin/clavulanic acid, and 66% of ceftiofur-resistant ESBLs became susceptible or intermediate with the addition of ampicillin/sulbactam. Antagonistic effects were rare among non-ESBL isolates (0.4%). Combining neither amoxicillin/clavulanic acid nor ampicillin/sulbactam with meropenem resulted in CRE isolate susceptibility. These findings suggest the combination of certain cephalosporins and β -lactamase inhibitors accessible to veterinarians could offer a viable carbapenem-sparing treatment approach for ESBL infections in veterinary species. Additional studies (pharmacokinetic and in-vivo) are required to verify these findings.

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Behavioral Effects of Repeated Exposure to Pyridostigmine Bromide

Cameron Whitmore and Russell Carr

Nerve gasses are chemical warfare agents that pose a potential threat to our warfighters. These compounds are organophosphates (OPs) that induce toxicity by inhibition of acetylcholinesterase (AChE) in the brain. To protect warfighters, the carbamate pyridostigmine bromide (PB) has been administered as a prophylactic. PB functions enhance the binding of nerve agents to peripheral non-target binding sites, thereby decreasing the amount of nerve gas reaching the brain. While PB does not cross the blood-brain barrier, it is possible that PB's actions in the peripheral nervous system may have some effects on the brain by indirect mechanisms. This study was designed to determine if repeated daily intake of PB alters behavior. Rats were administered PB daily by oral ingestion for 21 days. Behavioral testing occurred on days 14-19. Rats were tested for anxiety, activity, cognition, and depression. Using additional cohorts of rats, the level of cellular excitation in the amygdala was determined at 4-, 7-, 14-, and 21-days during treatment. There were no effects of treatment on body weight in either sex. Likewise, there were no effects of treatment on performance in the elevated plus maze, the sucrose preference test, or the novel object test. Activity levels were not affected in the open field. However, while males were unaffected, female rats treated with PB entered and spent more time in the center of the maze than did female controls suggesting a subtle reduction of anxiety levels. These data suggest PB treatment can exert sex-specific effects on behavior despite being unable to cross the blood-brain barrier.

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Investigation of antimicrobial resistance and virulence of *Escherichia coli* and *Klebsiella sp.* in pet reptiles

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Pet reptiles can become reservoirs for potential zoonotic bacteria, including some *Escherichia coli* and *Klebsiella* species. This study aims to investigate the antimicrobial resistance (AMR) profile of *E. coli* and *Klebsiella* in pet reptiles and characterize the virulence factors present in these bacteria. In this study, cloacal swabs from 18 pet reptiles, including ball python, cottonmouth vs. copperhead hybrid, copperhead, Nile monitor, green iguana, and savannah monitor, were sampled. Samples were cultured in tryptic soy broth (TSB), chrome select agar, MacConkey agar, and Levine EMB agar. Isolates that were pink on MacConkey, blue on chrome select agar, and green metallic sheen with a darker center on EMB agar were further purified and identified using a Biolog Gen III machine. Three *E. coli*, 3 *Klebsiella oxytoca*, and 1 *Klebsiella pneumoniae* were isolated from the samples. Antimicrobial susceptibility testing (AST) was conducted on *E. coli* using

ampicillin, gentamicin, cefepime, trimethoprim-sulfamethoxazole, tetracycline, and azithromycin, following CLSI guidelines. Zones of inhibition were interpreted based on CLSI criteria. *E. coli* was resistant only to ampicillin. *Klebsiella* spp. was found to be resistant to ampicillin, cefepime, and tetracycline. PCR was conducted with the *E. coli* samples and showed no virulence factors except one sample positive for the uidA gene. Sequencing and further virulence characterization for all isolates are also pending. With this study using a diverse sampling of pet reptiles, we aim to reveal enteric bacteria that house virulence factors and antimicrobial resistance, posing a potential risk to their caretakers and, on a broader scope, to public health.

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Investigating the effect of *Aeromonas hydrophila* infection on serum chemistry of channel catfish

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Aeromonas hydrophila (*A. hydrophila*) is a hemorrhagic and septicemic pathogen that causes fatal disease in channel catfish (*Ictalurus punctatus*). Infection has been shown to increase in severity when exposed fish have a compromised skin barrier as well as after feeding. While the exact pathogenesis is unknown, concentration of blood flow in the gastrointestinal tract after eating is suspected to exacerbate the disease. To simulate a break in the skin barrier, some of the fish received a clip on the fin. The catfish were separated into two control groups and four experimental groups. The control groups were fin clipped and fed (FCF) and not fin clipped and fed (NCF). The experimental groups were FCF, NCF, fin clipped and not fed (FCN), and not fin clipped and not fed (NCN). Each group consisted of one hundred fish which were infected with the ALG-15-097 strain of *A. hydrophila* and then had their blood collected at two, four, and eight hours post infection. Any convalescing fish also had a final sample drawn from them. Serum was collected from all the blood samples and processed using a Vetscan VS2 Chemical Analyzer. The serum chemistry values obtained will be analyzed to determine the effects of infection on the chemistry profile, which will allow greater insight into the pathology and which systems are most affected by the disease.

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