Research Project Title: Effects of branched chain volatile fatty acid or branched chain amino acid supplementation on fiber degradation and bacterial fatty acid profile in in vitro

Student Presenter: Mikaela Disbennett

Faculty Mentor: Jeffrey Firkins

Faculty Mentor Department: Department of Animal Sciences

Research Abstract: Cellulolytic bacteria play a critical role in ruminants, where they digest cellulose to provide nutrients for the animal. Branched chain volatile fatty acids (BCVFA; 4 or 5 carbons), when supplemented to cattle, act as a growth factor for cellulolytic bacteria. These BCVFA can be interconverted between branched chain amino acids (BCAA) or elongated to branched chain fatty acids (BCFA; ~13-20 carbons). The first aim of this study was to determine if supplementing BCAA was as effective as supplementing BCVFA for increased fiber degradation. The second aim was to determine if 13C isotope-labeled BCAA were being converted to BCFA in mixed rumen bacteria in vitro and, if so, to which BCFA. A 2 X 2 factorial treatment arrangement was used with a batch culture of rumen fluid containing either alfalfa, corn, hay, or an alfalfa-corn mixture. Treatments were control, BCAA, BCVFA, and a mixture. Samples were incubated for either 8 or 24 hours and analyzed for NDF degradation, volatile fatty acid concentration via gas chromatography (GC), and fatty acid (FA) concentration and 13C enrichment of those FA by ion-ratio mass spectroscopy (GC/IRMS). GC/IRMS requires FA to be methylated. Previous FA methylation resulted in FA concentration too low to accurately measure BCFA in bacterial membranes. To increase FA concentration, three methods of methylation were tested using batch cultures with alfalfa and the treatments listed above. Methods used less solvent, solvent evaporation, and a feed particle methylation procedure followed by solvent evaporation. Supplementing BCVFA verses BCAA had similar effectiveness on NDF degradation but displayed varying results when the two were combined. While still awaiting results to determine which FA methylation procedures created concentrated samples, GC/IRMS analysis showed most BCAA are being converted to isoC14:0, isoC15:0, anteisoC15:0, and C14:0 2OH FA. These results demonstrated in experimental trials that it’s acceptable to use BCAA in place of BCVFA and that BCAA is most likely being converted to BCFA to the same degree BCVFA are.
Research Project Title: Incidence of foot-and-mouth disease in cattle herds in far north region of Cameroon

Student Presenter: Ruba Elzein

Faculty Mentor: Rebecca Garabed

Faculty Mentor Department: Veterinary Preventative Medicine

Research Abstract: Foot-and-mouth disease (FMD) is caused by a highly communicable virus that affects cattle as well as other livestock species and is endemic in parts of the Middle East, Africa, and Asia. While the approximate sero-prevalence of FMD in many affected countries has been established, few studies report its persistence and spread in individual herds, specifically in developing countries with no national FMD vaccination program such as Cameroon. The purpose of this study was to use herder reports collected over a five-year period to track the incidence of FMD in both sedentary and mobile cattle herds in Far North Region of Cameroon. Pastoralists from 15 sedentary and 15 mobile cattle herds were surveyed twice per year, once in the dry season and once in the rainy season. Data was analyzed for incidence risk of FMD within herds using R and R Studio software. Current progress has revealed that 21.6% of cattle in sedentary herds displayed signs of FMD, while 43.1% of cattle in mobile herds displayed signs of the disease. These findings suggest that a difference or set of differences between mobile and sedentary herds (such as herd management, pasture location, herd movement patterns, pastoralist knowledge) may possibly contribute to an increase in reported signs of FMD. Further research is needed to determine what factors may correlate with this increase in reported FMD in mobile herds. Foot-and-mouth disease may affect animal welfare, herd growth, and pastoralists’ lives and economic wellbeing. This study provides novel information that can be used to develop preventive measures against this harmful disease in Far North Region of Cameroon.
Research Project Title: Validation of scan sampling techniques for behavioral observations of broiler chickens

Student Presenter: Tarshangi Dixit

Faculty Mentor: Monique Pairis-Garcia

Faculty Mentor Department: Animal Science

Research Abstract: Behavioral evaluation is an effective means to objectively assess individual animal welfare. However, behavioral evaluation can be time consuming and impractical for studies utilizing a large number of animals. Therefore, identifying alternatives to the continuous sampling methodology that minimizes labor while maintaining accuracy is critical. This is particularly important in studies assessing the behavior and welfare of broiler chickens given the scale of standard commercial facilities. The objective of this study was to validate the accuracy of eight different instantaneous scan sampling intervals (2 minute, 3 minute, 4 minute, 5 minute, 10 minute, 15 minute, 20 minute, 30 minute) when compared to 1-minute instantaneous scan sampling intervals for broiler chickens (Ross 708) housed in enriched pens (n=3; straw bales) and non-enriched pens (n=3). Video was recorded continuously over a two day period (12 hrs/day). Behavioral data was collected using 1-minute instantaneous scan samples for the following behaviors: sitting/lying, standing, feeding, and drinking. Data from one minute instantaneous scan sampling were statistically compared to the other sampling intervals using regression analysis. The regression analysis showed that all behaviors could be accurately estimated up to 4 minute scan intervals. The results from this study suggest that a 5-minute scan would accurately estimate feeding, sitting/lying and standing behaviors while more subtle or short behaviors such as drinking need a shorter sampling interval to be correctly estimated.
Research Project Title: Analytical determination of re-epithelization of porcine wounds using immunohistochemistry

Student Presenter: Carlie Francis

Faculty Mentor: Sashwati Roy

Faculty Mentor Department: OSUMC Department of Surgery

Research Abstract: Background: In United States, chronic wounds represent a major public health burden with 6.5 million cases per year costing more than 50 billion dollars. The burden is further aggravating due a sharp rise in the incidence of diabetes and obesity. It has been estimated that two-thirds of the chronic wounds get infected by biofilms. Infection of the chronic wounds with the multispecies microbial biofilms poses significant threat.

Objective: To study the re-epithelization of the pig back wounds using immunohistochemistry.

Method: Full thickness excisional wounds (2"x2") were created on the dorsum of the pigs and followed upto 31 days post wounding with or without infection with mixed bacterial species consisting of Pseudomonas aeruginosa, Acinetobacter baumannii and Staphylococcus aureus. The wound biopsies were collected on day 14 and day 31. To study re-epithelization of the wounds, formalin fixed paraffin embedded sections were deparaffinized and stained with eosin. Immunostaining with cytokeratin 14 (K14) antibody, of the OCT (optimum cutting temperature) embedded frozen sections of 10 μm was performed. For the blocking of the frozen sections, 10% nomal goat serum (NGS) was used. Fluorescent tagged secondary antibody (Alexa Flor 488 (green) was used for the K14. DAPI was used to visualize the nucleus. The stained sections were scanned with a Zeiss Axiovert 200 inverted fluorescence microscope supported by an AxioCam digital camera, a motorized stage, and guided by Axiovision software (Zeiss). The images were analyzed in image J or with the Zen software to determine the re-epithelization.

Results: The infected pig wounds showed impaired epithelization as compared to the non-infected pig wounds. Biofilm infection compromises the re-epithelization process. Current studies are ongoing to elucidate the mechanism for the impairment of the re-epithelization on biofilm infected wounds.
Research Project Title: The effects of supplementing essential long chain fatty acids to ewes in late gestation on offspring and ewes

Student Presenter: Lauren Hamer

Faculty Mentor: Alejandro Relling

Faculty Mentor Department: Animal Sciences

Research Abstract: Multiple studies have shown improvements in performance of livestock due to supplementation of polyunsaturated fatty acids. Other studies show an effect of fetal programming on offspring in livestock, though little work in this area has been done with ruminants. This research was conducted to evaluate the performance effect of ewes and their lambs when the ewes were supplemented with increasing concentrations of PUFAs DHA and EPA during the last 50d of gestation. The PUFA enriched diets were supplemented at concentrations of 0%, 1% and 2% to the ewe. Ewes started receiving the supplements at d-50. Supplementation finished at lambing. Ewes were weighed and BCS at d-50, d-20, d15 and d60. On d15 milk production and composition were evaluated after 3 hours of ewe and lamb separation. Lambs were bled and weighed on d1, d15, and d60. Data was analyzed using a mixed model of SAS. There was an effect (P=0.01) for BW. Ewes supplemented with 1% PUFA were heavier than ewes supplemented with 0 or 2% (94.8 vs 91.8 9.8 ±1.06). There were no differences in BCS, milk production, fat or protein concentration, but there was a trend to increase lactose concentration. There was no difference in lamb body weight, plasma glucose, or NEFA concentrations. However, there was a time by treatment interaction on ADG. Lambs of ewes supplemented at 1% showed a higher ADG (0.36 kg/d) than the 0% (0.31 kg/d) or 2% (0.33 kg/d) supplementation. The ADG from d15 to d60 was similar for the three treatments. This suggests that supplementation during gestation affects ewe and lamb growth depending on the dose of the diet. The fact that the 1% supplement showed a heavier BW for ewes and the highest ADG for lambs arises more questions to be answered on the biological effects of PUFA.
Research Project Title: Generation of transgenic quail expressing GFP within liver cells, via the LB-FABP promoter

Student Presenter: Erin Hamlin

Faculty Mentor: Kichoom Lee

Faculty Mentor Department: Animal Science

Research Abstract: Genetic modification is a technique that is being used in many aspects of health and agricultural research. The use of tissue specific gene promoters is one method to produce exogenous proteins in specific target tissues of transgenic animals. Using microarray data, we identified LB-FABP and C8A as highly liver specific genes. RT-PCR further confirmed the liver specificity of both genes. The LB-FABP and C8A promoters were identified using the National Center for Biotechnology Information (NCBI) BLAST program. The MatInspector program was used to identify liver specific transcription factor binding sites within the promoters to determine the size of the promoters to be used. A 2.1kb chicken LB-FABP promoter was chosen due to the location of liver specific transcription factors and conserved sites between multiple avian species. A lentiviral vector was then created containing either promoter, which was amplified via PCR, upstream of green fluorescent protein (GFP). The LB-FABP vector was chosen for this study, as it had a higher level of expression as demonstrated via a 293ft cell culture test. HEPG2 cell cultures were also used to test the functionality of the vector. The vector was then transfected by calcium phosphate transfection in order to create a viral soup which was later injected into stage X quail eggs. Currently, offspring of the chimeric founders are being screen through genotyping PCR to determine if offspring are transgenic. Once a transgenic bird is identified, it will be retained for breeding and its offspring will then be used for a functional study. Using tissue specific promoters such as the LB-FABP promoter, we have the potential to not only identify tissue specific genes, but eventually overexpress target genes within specific tissues of the birds. Such methods could be very beneficial to both the poultry industry and other fields of research.
Research Project Title: Cryopreservation of Dirofilaria immitis microfilaria-infected blood for teaching diagnostic techniques and practicing parasite identification.

Student Presenter: Sidney Long

Faculty Mentor: Antoinette Marsh

Faculty Mentor Department: Veterinary Preventative Medicine

Research Abstract: Proper diagnosis of Dirofilaria immitis, the causative agent of Heartworm, is critical as this disease can be fatal, is expensive to treat, and undiagnosed dogs serve as a source of infection. Heartworm spread is influenced by factors such as climate change, wildlife reservoirs, mosquito populations, and undiagnosed dogs. Diagnostics is confounded by antibody-antigen blocking causing false negative antigen and antibody testing; therefore, detection of microfilaria is an important diagnostic skill being taught. However, finding a supply of recently acquired blood containing D. immitis microfilaria when scheduled to teach the technique presents a challenge. To address this issue, the goal of this research evaluated the use of cryopreserved blood in two standard diagnostic tests; Modified Knott’s and carbonate filter tests. The specific aims included 1) determine if cryopreserved D. immitis microfilaria could still be detected in the assays and 2) compare the morphology of the microfilaria following cryopreservation over time. With this information, teaching laboratories could substitute cryopreserved microfilaria in lieu of freshly collected blood. To evaluate the cryopreservation, two different isolates of freshly harvested whole blood containing D. immitis microfilaria were used. One aliquot of fresh blood was removed, designated as a baseline and was processed immediately using the two diagnostic techniques. The remaining blood was mixed with 1:1 with Glycerolyte, divided into aliquots and froze at -20 °C for later processing on days, 7, 21, and 90. The quantity and morphology of the microfilaria were compared with the baseline and between aliquots. After freezing, the microfilaria could be detected in lower yields as compared to the baseline. Interestingly, the Glycerolyte also preserved the red blood cells, making the cells more difficult to lyse, resulting in a more difficult slide to read due to the intact cells. These results provide evidence that using cryopreservation to store blood containing microfilaria for teaching diagnostic techniques will work; the overall concentration of microfilaria on the slide will be less; and individual microfilaria will be more difficult to see. We plan to evaluate students’ ability to perform the assays and correctly identify the microfilaria with these less than optimal samples.
Research Project Title: Effect of lysophospholipid on rumen fermentation and feed digestibility: In vitro

Student Presenter: Jade Hettick

Faculty Mentor: Chanhee Lee

Faculty Mentor Department: Animal Sciences

Research Abstract: Lysophospholipid is hydrolyzed phospholipids and has been studied in pigs and poultry as a feed additive where improved production and feed efficiency were reported. Phospholipids extracted from soy were hydrolyzed to produce lysophospholipids (LPL; Lipidol Ultra®, Easybio inc., Seoul, Korea) where 70% of phospholipids were lysophospholipids. We hypothesized that LPL can have beneficial effects on feed digestibility and utilization efficiency. The experiment was conducted in vitro. Rumen fluid was collected from two cannulated beef steers (350 kg of BW) fed a typical growing diet (about 65% corn silage; 14% CP on a DM basis). Buffer solution was prepared prior to collecting rumen fluid and flushed with O2-free CO2 for about 2 h to remove O2 in buffer. The rumen fluid was mixed with the buffer in a 1:3 ratio and buffered rumen fluid was then distributed into 125-mL serum bottles (total 60ml) containing substrates under a stream of O2-free CO2 gas. After inoculation, bottles were immediately sealed with a 14-mm butyl rubber stopper plus aluminum crimp cap. The bottles were placed in a shaking incubator at 39Â°C. Substrates (1 g) prepared in the incubation serum bottles were as follows: 1) Mon, a basal diet containing monensin (Rumensin 90; Elanco; dosage rate, 350 mg monensin/head/day), 2) Cont, the basal diet; LLPL, the basal diet containing 0.025% LPL (DM basis), MLPL, the basal diet containing 0.050% LPL (DM basis); HLPL, the basal diet containing 0.075% LPL (DM basis). The incubation was conducted at 3, 6, 12, 24, and 48 hours. At each time point, samples were collected from individual bottles and analyses are in progress. Methane production, total protozoa, gas pressure, VFA concentrations, ammonia concentrations, digestibility of DM, and NDF will be determined. Since this study was in vitro, an in vivo study will be conducted.
Research Project Title: Positron emission tomography/computed tomography (PET/CT) radiation dose reduction in a canine model

Student Presenter: Richard Moore

Faculty Mentor: Isabel Menendez

Faculty Mentor Department: Radiology

Research Abstract: Positron Emission Tomography (PET) is an imaging modality that uses radioactive tracers that are injected in the patient in order to produce an image. Fluorine-18-sodium fluoride (Na18F) is a bone-seeking tracer. The aim of this study was to assess the difference in exposure rates from the standard dose and an ultra-low dose in a canine model using Na18F dPET/CT. Ten adult male beagles were scanned and surveyed before and after each scan. The canines were injected with five different doses. The canines were surveyed with a Cs137 Model 3A Survey Meter with pancake GM probe with exposure filter. The counts per minute (CPMs) were measured and recorded by surveying the canine from head to toe holding the probe 15 cm above the body. Each post-scan survey was taken approximately 120 minutes post injection. The CPMs were averaged for each post-scan survey in each dose category. Two blinded readers evaluated the images for overall quality for diagnosis purposes. All the surveys and scans were successfully completed in all the subjects. There was 33.6 fold reduction in the exposure rates between the standard dose (mean ± SD; 23500 ± 1500) and the ultra-low dose (mean ± SD; 700 ± 100) CPMs. When the SD images were compared with the ULD images, the overall quality of the ULD images were acceptable for qualitative assessment. The 33.6 fold reduction in the exposure rates between the standard dose and the ultra-low dose is a feasible option to decrease the total radiation exposure in accordance with ALARA (as low as reasonable possible). Moreover, the reduction of exposure rate would not only significantly decrease radiation risks in the research animal, but also in veterinary patients, staff personnel and the pet’s owner. This radiation reduction effectively eliminates the need to house the canine in a specialized radioactive room for isolation. Effectively bypassing this step would save time, space and energy.
Research Project Title: Evaluation of effects of different necrotic enteritis models in chickens

Student Presenter: Jack Korenyi-Both

Faculty Mentor: Lisa Bielke

Faculty Mentor Department: Animal Sciences

Research Abstract: The purpose of this research is to evaluate the effects of different necrotic enteritis (NE) models in boilers. Necrotic enteritis is a multifactorial acute enterotoxaemia that is often fatal and costs $6 billion annually around the globe. Currently, the most widely used research induction of NE is a combination of main causative agent Clostridium perfringens (CP) and Eimeria maxima (EM). Although occurrence of NE recently arose with CP toxin NetB without the presence of Eimeria. In this experiment, 9 sets of birds were given different treatments. All birds were treated with Salmonella Enteritidis, except negative control groups. Remaining groups received a combination of EM strains Guelph and M6 with different forms of CP, and different forms of CP alone to further explore the roles toxins and strains play in the pathogenesis of NE. Through the analysis of lesion scores, mortalities, body weights, and necropsies, all models were evaluated for severity of NE. Groups challenged with EM and CP Net B- (a dual infection model) gave the strongest indication of NE, with significantly higher lesion scores ($p<0.05$). Also showing signs of NE were the groups challenged by feed with CP, specifically the Net B+ form, though lesions scores were lower ($p<0.05$) than dual infection models. The unwashed form of CP, which contained toxins, metabolites, and by products from growth, showed the most drastic change in percentage bodyweight gain change ($p<0.05$). The washed form of CP, which consisted of the anaerobic bacteria alone, produced similar results, just slightly lesser change in percentage bodyweight gain. In conclusion CP alone did not create lesions, but did change performance characteristics which were typical of NE. These results provide insight regarding effective NE model, which will allow for preventative methods to be backed by research and science.
Research Project Title: Preconditioning sows with classical music to reduce aggression in group housing

Student Presenter: Nicole Lorig

Faculty Mentor: Kelly George

Faculty Mentor Department: Animal Sciences

Research Abstract: The current study examines the effect of preconditioning with music on aggressive behavior among sows placed in group housing. One group of sows was exposed to five minutes of classical music for five days preceding placement into a group pen (music group, n = 8). The control group was exposed to five minutes of background noise for five days preceding placement into the same group pen (non-music group, n = 7). During preconditioning, each group was offered feed. It was hypothesized that preconditioning with music would reduce aggressive behaviors (initiating, reciprocating, or avoiding altercations). The results confirm that preconditioning with music does reduce the number of these behaviors. The results of this study suggest that continued exploration of the use of music prior to or during exposure to group housing could benefit the swine industry.
Research Project Title: The role of jackpot shows in the transmission and dissemination of influenza A virus in exhibition swine

Student Presenter: Dillon McBride

Faculty Mentor: Andrew Bowman

Faculty Mentor Department: Veterinary Preventive Medicine

Research Abstract: Swine are influenza A virus (IAV) hosts, and zoonotic infection risk is high at agricultural fairs due to close human-swine interactions and high IAV prevalence. In addition to agricultural fairs, exhibition pigs are shown at “jackpot shows” that occur throughout the year and importantly in the spring and summer prior to local agricultural fairs. Jackpot shows are open to any age competitor and often involve several youth exhibitors who travel from multiple geographical locations allowing interaction of swine from various locales. IAV prevalence and transmission in jackpot show pig populations had not been previously studied, therefore, surveillance was conducted to estimate IAV prevalence in swine at jackpot shows. Nasal wipe samples were collected from pigs at 23 jackpot shows across six states during May through July 2016 for a total of 3754 samples. IAV was detected via RT-PCR in 461 (12.3%) samples, and viable virus was recovered from 120 (3.2%) samples. Compared to the 2016 agricultural fair season, PCR positive 19.4% and virus isolation positive 12.3%, jackpot shows had significantly lower IAV prevalence than fairs (p<0.0001), possibly due to differences in show structure including a shorter period of pig interaction. H1N2 and H3N2 subtypes were recovered including an emerging H3N2 strain that was not previously detected in exhibition swine. The same novel strain was detected one month later in pigs at an agricultural fair and subsequently resulted in zoonotic infections. The results indicate that jackpot shows play a critical role in early transmission and dissemination of IAVs in exhibition pigs prior to agricultural fairs. IAV surveillance in exhibition swine during winter months could allow timely detection of IAV strains threatening public health and allow for early intervention prior to the summer agricultural fair season.
Research Project Title: PFK-1 transcript amounts in the liver and skeletal muscle of pigeons and quail acutely exposed to high embryonic incubation temperatures

Student Presenter: Michael Loveless

Faculty Mentor: Pasha Peffer

Faculty Mentor Department: Animal Science

Research Abstract: The developing avian embryo is reliant on external sources of heat. Incubation temperatures above or below optimal alter development and metabolic function, and may compromise emergence and post-hatch adaptation. Studies in chick embryos indicate that high incubation temperature increases glycolysis and reduces hepatic glycogen needed during hatching. As a key glycolytic enzyme, phosphofructokinase-1 (PFK-1) is a likely target for the temperature-induced effects on pathways of glucose metabolism. However, there is limited data characterizing PFK-1 in avians exposed to high incubation temperatures. This study used real time PCR to compare PFK-1 mRNA transcript amounts within the breast muscle and liver tissue of the precocial japanese quail (Coturnix japonica) and the semi-altricial domestic pigeon (Columbia livia). Tissue samples were collected previously from birds exposed to increased incubation temperatures (40.8°C for 3 hours during embryonic d 10 and 11 for quail, and d 13 and 14 for pigeon, equivalent to Hamburg and Hamilton stages 39 and 40) or a control temperature (37.6°C throughout incubation). Total RNA was isolated, reverse transcribed, and cDNA was pooled by species and heat treatment for analysis. High incubation temperatures resulted in a down regulation in PFK-1 transcript amounts in both liver and breast muscle in pigeons. Transcript amounts were 50 and 2.78 fold greater for liver and breast muscle, respectively, for birds incubated under control temperatures compared to high heat. Similarly, PFK-1 transcript amounts in quail liver of birds exposed to high incubation temperatures was 80% the value of the control, but breast muscle PFK-1 transcript amounts increased 65%. Findings suggest unique effects of incubation temperature for precocial compared to altricial species.
Research Project Title: The effects of lysozyme on feed efficiency and growth performance in swine

Student Presenter: Hailey Shoemaker

Faculty Mentor: Lyda Garcia

Faculty Mentor Department: Department of Animal Sciences

Research Abstract: Subtherapeutic antibiotics have played a key role in the pork industry in the United States, contributing to improved feed efficiency, herd health, and growth rate. However, to administer antibiotics subtherapeutically means that the antibiotics are not "necessary" and are delivered in a low and slow fashion, which can lead to dangerous, antibiotic-resistant bacteria, which could undermine the effectiveness of important drugs in both animal and human medicine. When the most recent Veterinary Feed Directive banned the use of antibiotics subtherapeutically in swine production, producers and scientists began seeking an equal or superior alternative to this method. Lysozyme is a naturally occurring enzyme in bodily secretions that has been shown to alter small intestine morphology and improve growth effects in pigs, however, the effects on feed efficiency have yet to be considered. The aim of this project is to investigate the effects of lysozyme on feed efficiency, as well as to evaluate the conversion of feed to saleable product. Thirty pigs, fifteen gilts and fifteen barrows, from similar genetics and of similar weights, were weaned at week four of age and separated into six pens according to gender and treatment. All pigs were weighed weekly, all feeders were weighed (for feed intake) weekly, and feed waste was noted daily--which allowed for evaluation of feed efficiency. The pigs are being grown to a range of 260-280 lbs. and thus far one pig has been slaughtered, and the evaluation of carcasses allows one to evaluate the conversion to saleable product. All data is projected to be collected and analyzed by end of March or beginning of April.
Research Project Title: Behavioral and production effects of environmental enrichment on fast-growing broiler chickens

Student Presenter: Julia Rose

Faculty Mentor: Monique Pairis-Garcia

Faculty Mentor Department: Department of Animal Science

Research Abstract: In order to promote natural behavior in livestock species as a means to improve welfare, physical enrichment has been implemented in commercial poultry facilities. However, to date, there is limited research validating the quality of commonly used enrichment items such as straw bales on the behavior and performance of broiler chickens. The objective of this study was to quantify the behavioral and production effects of straw bale enrichment on commercial broilers. A total of 104 “Ross 708” broilers were enrolled on the trial and randomly assigned to one of two treatments; Control (C, standard pen with litter, 2.790m2), Enriched (E, standard pen with litter, 2.790m2 and straw bale 0.279m2). Day one old chicks were allocated to one of eight pens (C: n=4; E: n=4) with 13 chicks per pen (C: 0.215m2/bird; E: 0.193m2/bird) and housed until five weeks of age. Behavior was collected using live observation with five minute scan samples, four hours per day for three days a week. In addition, weight, feather quality, and foot pad lesions were scored weekly. Feed conversion rates and total feed consumed were calculated weekly.
Research Abstract: Dairy calf welfare is an important topic in animal science. While there is research on enrichment and brush use in adult cows, there is limited research addressing brush use in calves. The objectives of the study were to substantiate the use of brushes as enrichment devices for calves and determine if exposure to stationary brushes pre-weaning affects use of brushes post-weaning. In the study, calves were randomly grouped into treatment group B (with brush, n=10 calves) or treatment group N (no brush, n=10 calves). During the pre-weaning period, calves were housed individually in hutches from birth until at least 8 weeks of age, and group B had access to stationary brushes. During the post-weaning period, calves entered group housing and had access to both a mechanical and stationary brush until at least 11 weeks of age. Physical performance characteristics were recorded throughout the trial, and behavior was recorded using video cameras for 12 hours/day twice a week. During the pre-weaning period, the treatment groups had similar weight (41.8 kg), hip height (75.8 cm), and wither height (72.4 cm). During the post-weaning period, the treatment groups had similar weight gain (0.747 kg/day), changes in hip height (0.212 cm/day), and changes in wither height (0.204 cm/day). This suggests exposure to stationary brushes pre-weaning did not affect calf growth. In preliminary behavior analysis for 8 calves pre-weaning, group B (n=4) used stationary brushes for 3.7 min/12 hr, which demonstrates that calves utilized stationary brushes as enrichment tools in the pre-weaning period. The treatment groups spent similar durations interacting with pen fixtures pre-weaning (553±125 vs. 636±131 sec/12 hr for B and N respectively). In preliminary behavior analysis of 5 calves post-weaning, duration of mechanical brush use was similar between treatment groups (360±127 vs. 100±104 sec/12 hr), but we anticipate that differences will become pronounced as we analyze additional data. The duration of stationary brush use post-weaning was minimal, thus we conclude that calves prefer the mechanical brush from these initial observations. We expect further analysis to show behavioral differences between treatment groups, indicating that exposure to a brush pre-weaning affects calf behavior post-weaning.
Research Project Title: Methods to improve anesthetic thermoregulation and postoperative recovery time in the acute kidney injury canine model

Student Presenter: Madeline Schwarz

Faculty Mentor: Raphael Malbrue

Faculty Mentor Department: Department of Veterinary Preventative Medicine

Research Abstract: Dogs (Canis familiaris) have historically been used as an animal model to study a variety of diseases and surgical techniques in biomedical and veterinary medical research. Quite often when patients undergo abdominal surgeries, an extensive incision is required (xiphoid to pubis; ~10-12 cm in length). This can result in a traumatic decline of the patient’s core body temperature and increase the risk for unwanted adverse events. The purpose of this study is to evaluate the use of generic hand warmers as an effective adjunctive technique for improving and supporting perioperative thermoregulation in patients undergoing invasive abdominal surgical procedures. We additionally investigated the effects on postoperative recovery time. A total of 8 adult intact male beagles (n=8) were used in this study. Subjects were randomly assigned into two experimental groups (n=4 per group): (A) dogs who received hand warmer heating source or (B) Control group; no hand warmer source. All subjects underwent a nephrectomy of the left kidney, and experimentally induced renal ischemia using bulldog clamps to the contralateral kidney. Temperature at the beginning and completion of surgery was recorded. Recovery time for each subject was additionally observed. An overall increase in core body temperature was seen perioperatively in subjects with hand warmers applied; however, no statistical significance was found between study groups at any time point (p=0.078). No significant difference was noted when comparing recovery time amongst groups. We attribute these results to the overall small sample size (n=8). Future studies should include additional animals to continue to assess the overall benefits of using hand warmers as an adjunctive method of thermoregulation during anesthesia.
Research Project Title: Effects of maternal dietary phospholipids on neonatal piglet intestinal health

Student Presenter: Ariel Taylor

Faculty Mentor: Sheila Jacobi

Faculty Mentor Department: Animal Sciences

Research Abstract: Effects of Maternal Dietary Phospholipids on Neonatal Piglet Intestinal Health

Ariel A. Taylor, Joana Ortega-Anaya, Emily K. Chucta, Rafael Jimenez-Flores; Sheila K. Jacobi

Dietary nutrients are essential for gastrointestinal (GI) growth and function, and a significant component of neonatal development require the nutritional support of GI growth and development. Nutritional provisions of the mother's milk support normal maturation of structure and function of the GI tract in most neonates. The composition of mother's milk affects GI, mucosal immune system, and neurological development. The functional nutrients and other bioactive components of milk support a microenvironment for gut protection and maturation. However, early intestinal maladies can impair normal GI development, leading to intestinal dysfunction and even death. Therefore, our study evaluated sow milk composition and how the bioactive phospholipids of the milk fat globule membrane impact gut barrier function in swine, a dual-purpose agri-medical model. Experiment 1, collected colostrum and mature milk from 11 first parity sows at 12-24h and 8-10d post-partum, respectively. The percent total solids were significantly greater in colostrum samples compared to mature milk samples (23.51 vs. 19.29 ±1.34; P<0.05), however total fat was not significantly different between sow colostrum and mature milk (8.93 vs. 8.33 ± 0.78; P>0.05). In additional experiments phospholipid composition is being analyzed from colostrum and milk, as well as investigating the effects of dietary MFGM phospholipids compared to soy phospholipids on piglet gut barrier function following a challenge. In conclusion, we know milk composition changes over lactation and changes in milk solids, specifically phospholipids may play an important role in modulation of intestinal health in neonates.
Research Project Title: The impact of growth selection on meat quality in a turkey line selected for increased 16 week body weight

Student Presenter: Alexandra Voytko

Faculty Mentor: Daniel Clark

Faculty Mentor Department: Animal Sciences

Research Abstract: Due to increasing consumer demands, turkeys have been continually selected for faster growth and increased breast meat yield. However, the resulting physiological changes have also impacted meat quality. The objective of this study was to determine how selection for increased body weight over 50 generations has impacted breast meat quality. To accomplish this, a random bred control line (RBC2), comprised of genetics from the 1960’s, was compared to a line originally selected from the RBC2 line and has been continually selected for increased 16-week body weight (F-line). Feed intake and body weight were monitored weekly until market age. Upon processing, meat yield was assessed by weighing the pectoralis major and minor muscles. Meat quality was assessed by evaluating color, shear force, cook loss, and proximate composition of the pectoralis major. Additionally, muscle morphology was analyzed via hematoxylin and eosin staining. Average daily gain, carcass weight, pectoralis major weight and yield, and pectoralis minor weight were greater in F line turkeys (P<0.03) compared to RBC2 turkeys. Feed efficiency was not different between the two lines. Additionally, there were no differences in breast color, cook loss or shear force between the F and RBC2 lines (P > 0.19). However, the F line had more intramuscular fat, and had less moisture (P < 0.01) compared to the RBC2 line. Myofiber width was also increased in the F line turkeys (P < 0.01) compared to the RBC2 line, however, myofiber morphology was not different between the two lines. These data suggest that selection for increased body weight has increased growth and improved breast meat yield, but also increased intramuscular fat in the breast muscle. Turkey breast is often preferred by consumers because it is a lean, high quality protein product, however, increased intramuscular fat in growth-selected turkeys may negatively impact consumer purchasing habits.
Research Project Title: Effects of prebiotics on growth, non-esterified fatty acids and glucose in bottle fed dairy heifers

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Research Abstract: Dairy Heifers are a key component to dairy farms as they are integrated into the herd as replacements for milk production. For this reason, their health and performance is imperative. The use of prebiotic like supplements such as Saccharomyces cerevisiae fermentation product (SCFP) has become a popular option in the dairy industry, with the intent of increasing heifer performance. This study evaluates the effect of SCFP on body weight (BW), feed intake (FI), plasma glucose, insulin, and non-esterified fatty acids (NEFA) concentrations. As heifers were born they were randomly assigned to one of two treatment groups: control (C) or prebiotic (SCFP) supplement. All calves received colostrum post birth followed by 3 L of milk twice daily and a concentrate beginning on day 3. The SCFP treatment was added in the milk (1 g/d, SmartCare, Diamond V) and in the concentrate (0.7% of the concentrate, NutriTek, Diamond V). Concentrate grain was pre-weighed and calves’ refusals were weighed twice a week. With this data, an average daily FI (in dry matter bases) was calculated. Body weight was collected on days 0, 14, and 30. Jugular vein blood samples were obtained on days 7 and 14 for plasma glucose, NEFA and insulin analysis. Data was analyzed using a mixed model (SAS 9.4) with repeating measurements, considering the fix effect of treatment, time and their interaction and the random effect of calf. There were no differences (P>0.20) on BW, FI, plasma insulin, nor glucose concentration, but there was a time by treatment effect on plasma NEFA concentration (P=0.04), in which C had a plasma NEFA concentration of 267.1 and 206.6±15.58 ÂµM for day 7 and 14 and SCFP had a 238.3 and 235.1 Â±14.55ÂµM for day 7 and 14, respectively. With this data, we conclude that under these conditions the administration of SCPF does not improve performance (BW and FI). This data suggests that feeding SCFP could have an effect on plasma NEFA concentration within the calves’ first week, but we cannot explain the physiological mechanism for this response. More research is required to make any further determinations.