COMPANION ANIMAL

0418 *Ehrlichia canis* in canines from Culiacan, Sinaloa, Mexico. I. Enríquez Verdugo*, B. E. Lopez Gallegos, C. Barraza Tizoc, N. Castro del Campo, D. Solis Carrasco, S. M. Gaxiola Camacho, J. Gaxiola Montoya, and M. C. Rubio Robles, *FMVZ-Universidad Autonoma de Sinaloa, Culiacan, Mexico.*

Ehrlichia canis is a Gram-negative obligate intracellular bacteria and is recognized as the causative agent of Canine Monocytic Ehrlichiosis (CME). CME is transmitted by the bite of previously infected ticks, and the main vector includes *Rhipichepalus sanguineus*. In the last decade, this tick has been considered a potential zoonotic pathogen, particularly in the area of veterinary medicine. Clinical diagnosis is based on history, clinical signs, hematological studies, cytology, serology and isolation methods. The aim of this study was detection of *Ehrlichia canis* in dogs from Culiacan, Sinaloa, Mexico by ELISA technique. The study was done in the laboratory of parasitology from the FMVZ-UAS. Blood from 81 dogs, with or without clinical signs or presence of ticks, was collected in sterile EDTA tubes from each dog using the cephalic vein. The bacteria was detected by blood smear and each sample was stained with Wright's solution and observed under light microscopy (100x) using a double blind approach. The serological study was performed using ELISA techniques (IDEXX® 4Dx). Detection of *E. canis* was performed using light microscopy, resulting in 11 positive samples and a frequency of 13.5%. Serological tests resulted in 14 samples reacting to the presence of specific antibodies against the bacteria, and a frequency of 17.2%. In conclusion, the presence of *Erhlichia canis* in dogs from Culiacan, Sinaloa, Mexico, indicates a risk to public health due to the close contact with pet dogs and the vector *Rhipichepalus sanguineus*, causing dogs to be a factor for the dissemination of this zoonotic pathogen.

Key Words: *Ehrlichia canis,* canine, blood, ELISA

419 Effect of dietary composition over food preferences of dogs. J. Figueroa, S. A. Guzmán-Pino, S. Morales*, and C. Muñoz, *Universidad de Chile, Santiago.*

The feeding behavior of dogs has been studied during several years by food preference tests that allow formulating new and specifics diets satisfying animals' needs and increasing animals' pleasure. Nevertheless, besides the sensorial characteristics of diets (smell, taste, viscosity, etc.), nutrient composition (energy, protein, dry matter, etc.) may influence dogs' food preferences. The aim of this study was to analyze the relationship between the nutritional compositions of dog's diets and their associated preferences. A database of preference test from 10 yr (2003–2013) was obtained from the Research Center of Pet Feeding Behavior (Facultad de Ciencias Veterinarias y Pecuarias, Universidad de Chile). Preference tests performed during those years consisted on the placement of two simultaneous feeders in the front of dogs' cannels during 10 consecutive minutes. Food was weighted at the beginning and end of each test to calculate animals' food intake. In each preference test, the nutritional composition of both diets was analyzed, and the difference between the nutrient components of the most preferred diet (A) and the other diet (B) was used for the statistical analysis. To evaluate how nutritional components or group of components may explain food preferences, data was analyzed by doing a principal component (PC) analysis using the princomp procedure of the statistical software SAS. A linear regression was performed between each principal component obtained and dogs' preferences. Later, a Spearman correlation was performed with the nutritional components that represented the greatest variability within the main component that showed a significant linear regression. The first tree principal components presented eigenvalues close to 1 that explained the 74% of the data variability (37.4, 25.1 and 12.5%, respectively). After the linear regression between each principal component and dogs' food preferences (diet A) it was observed that only the third component (dry matter, nitrogen-free extract and metabolizable energy) presented a relation ($P = 0.040$). Dry matter and nitrogen-free extract showed negative correlations with preferences ($r = -0.239$; $P = 0.008$ and $r = -0.188$; $P = 0.039$), respectively. These results show that some nutritional components may affect the food preferences of domestic dogs. Diets humidity, followed by carbohydrate fractions, seems to have the highest repercussion on dogs' behavior during a food choice test.

Key Words: domestic dog, food preferences, nutrient composition

0420 Hind limb kinematics of the Weimaraner at the trot. L. Carlisle[1], M. C. Nicodemus*[1], and K. Slater[2], *[1]Mississippi State University, Starkville, [2]Banfield Pet Hospital, Magnolia, TX.*

Large dog breeds are plagued with hip dysplasia, and yet, some larger breeds such as the Weimaraner have been reported to have a lower percentage rate of hip dysplasia within the general population. Temporal variables of the trotting Weimaraner have been reported as being unique from other large breeds. Understanding the uniqueness of the gait mechanics of the Weimaraner may assist in early clinical diagnosis of hip dysplasia and help in the understanding of why this particular breed has a lower rate of dysplasia. Therefore, study objectives were to measure the trotting hind limb kinematics of the Weimaraner. Six American Kennel Club registered Weimaraner dogs were filmed at 60 Hz being led on even, natural footing at the trot (velocity: 1.9–2.3 m/s). Reflective markers

attached to palpation points on the proximal and distal aspects of the lateral side of the hind limb were tracked and analyzed using APAS (Ariel Dynamics Inc., Trabuco Canyon, CA). Ten strides per dog were used to determine means + SD of measured kinematic variables. Selection of strides was based on soundness, gait correctness, consistency, and noticeable foot placement and lift-off. During the trot the dogs stayed fairly level across the hindquarters demonstrating minimal horizontal displacement of the pelvis (2.8+0.7 cm) throughout the stride cycle. This may be due to the relatively minimal horizontal displacement of the trotting hind paw (9.7+2.1 cm) suggesting despite the presence of suspension during the stride the hind limbs stay fairly low to the ground at the trot similar to that seen in the German shepherd. When comparing the joint data collected for the Weimaraner to other large dog breeds (Labrador, Rottweiler), joint angular displacements were comparable in the hip joint (29.8+1.0°), but slightly less range of motion than the other breeds in the tarsal (36.1+3.7°) and stifle (46.8+5.6°) joints. This could be related to breed differences or could be attributed to weight differences as the other breeds were heavier made breeds in which obese dogs were found to increase range of motion with increased weight to assist in absorbing the extra concussion. Furthermore, the slightly less angular displacements of the tarsus and stifle would also explain the minimal pelvic horizontal displacement in which this reduced lifting and dropping of the hindquarters will assist in minimizing concussive forces. These kinematic variables demonstrate uniqueness within the breed and suggest further kinematic research of other large dog breeds.

Key Words: Weimaraner, kinematics, trot

0421 The effect of source and drying process on amino acid composition and protein quality of dried poultry used in high-quality pet diets and select human foods.

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Information regarding composition, functionality, acceptability, and nutrient utilization of new protein sources used in pet foods can be relatively scarce. The objective of this experiment was to evaluate nutrient composition and protein efficiency ratio (PER) of various poultry proteins used in processed pet and some human foods. The experimental protein sources were analyzed for proximate and amino acid composition. Experimental protein sources from spray dried egg (SDEG), chicken by-product meal (CPBM), chicken meal (CKML), 6 fluid-bed-dried chicken samples (FBC 1–6), fluid bed dried turkey (FBDT), 4 spray-dried chicken samples (SDC 1–4), and a spray-dried high fat chicken (SDHF) were added to a N-Free basal ration in exchange for an equal portion of the corn starch and dextrose to provide 10% CP. Day old male broiler chicks (Cobb X Cobb) were acclimated to battery pens for 7 d with ad libitum access to starter diet (23% CP) and water. Chicks were fasted overnight then allotted to pen by weight. Pen (5 chicks ea) was the experimental unit with four pens per treatment randomly assigned to battery (block). Chicks were fed treatment diets for 10 d then weighed and feed intake recorded. The PER was computed as chick gain per unit protein intake and analyzed for differences using the GLIMMIX procedure of SAS (v9.4). The CP ranged from 50.1% for SDEG, to 67.4% and 67.7% for the CBPM and CKML, to an average of 71.7% for the FBC1–6, 73.3% for FBDT, average 74.6% for the SDC1–4 and 45.6% for the SDC5. The CBPM, CKML, and FBC6 had the highest hydroxyproline levels, the EAA:NEAA were high (> 0.95) for all samples except CBPM, CKML, and FBC6 (0.70, 0.70 and 0.80, respectively) and availability of lysine exceeded 95% for all samples. The PER for SDEG was 4.84. When PER was expressed as % of egg PER (EGGPER) the CBPM and CKML were lower ($P < 0.05$; 71% and 62%) than egg PER. FBC1–5 and FBDT did not differ from EGGPER, but the FBC6 was lower ($P < 0.05$; 88.2% of EGGPER) The SDC1–5 had a lower ($P < 0.05$) EGGPER (average of 85.6%) than fluid bed dried chicken. These data suggest that gently drying poultry via fluid-bed retained protein quality similar to SDEG and may differ slightly relative to spray-drying. However, whether this was because of process or ingredient composition differences was not fully elucidated by this study.

Key Words: pet food, protein ingredients, chick PER

0422 The amino acid composition and protein quality of various poultry and vegetable proteins commonly used in the production of dog and cat diets.

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Novel protein ingredients support the growth of the pet food market and new product development. However, some new protein sources (e.g., spray-dried chicken, rice protein concentrate, pea protein concentrate, and potato protein concentrate) have limited or no data available regarding their protein quality. The objective of this study was to evaluate several new protein ingredients used in the pet food industry for nutrient composition and protein quality using a chick protein efficiency ratio (PER) assay. Following proximate and amino acid analysis, 7-d old male Cobb x Cobb broilers were fed experimental diets for 10 d. Birds were allotted to pen ($n = 6$) by weight and randomly assigned to battery ($n = 4$). To the N-free basal ration test proteins were included to contribute 10% CP. The experimental protein sources included spray-dried egg (SDEG), spray-dried egg white (SDEW), spray-dried egg enriched with yolk (SDEY), chicken byproduct meal (CBPM), chicken meal (CKML), low temperature air-dried chicken meal (TACM), low temperature and pressure-fluid-bed-dried chicken (TPCK), spray-dried chicken (SDCK), whey protein

concentrate (WPCT), corn gluten meal (CGML), corn protein concentrate (CPCT), potato protein isolate (PPIS), rice protein concentrate (RPCT), pea protein isolate (PEPI), soy protein isolate (SPIS), and soybean meal (SBML). Data were analyzed using the GLIMMIX procedure of SAS (v9.4). Proximate analysis of all test ingredients were compatible with values reported previously except for the higher fat content of SDEG. Chicks fed SDEG, SDEY, and TPCK had the highest PER ($P < 0.05$; 5.18, 5.37, and 5.33, respectively) and the CBPM and CKML were the lowest among the poultry proteins for EAA:NEAA (0.79 and 0.74), PER (3.59 and 2.91), and Lys availability (84.1% and 78.0%). Among the vegetable proteins PPIS and SBML had the highest ($P < 0.05$) PER values (3.60 and 3.48) and Lys availability (95.4% and 93.4%). Whey protein concentrate and CPCT had the lowest PER values (−0.90 and −0.80), despite the high CP (76.10% and 78.83%) and Lys availability (95.2% and 88.9%). In general the chick PER method was effective at comparing the quality of protein sources and was consistent with the EAA:NEAA and Lys availability.

Key Words: protein ingredients, pet food, protein efficiency ratio, PER

0423 The effect of Miscanthus grass as a fiber source in cat diets on nutrient utilization and stool consistency. R. A. Donadelli*, C. G. Aldrich, and I. C. Alvarenga, *Kansas State University, Manhattan.*

High levels of insoluble fiber are commonly used in cat foods to increase energy dilution (weight loss) and to promote digesta flow (reducing hairballs). There are two commonly used fibers: cellulose (CE) and a beet pulp (BP). Miscanthus grass (MG) is a C4 forage grown for its cellulose content. Nutritional information for MG is scarce; therefore, the objectives of this study were to determine the effect of 10% fiber in cat diets on nutrients digestibility and stool consistency. Experimental diets were based on 90% of ration (low ash chicken byproduct meal, brewers rice, corn, wheat, corn protein concentrate, minerals and vitamins, both as recommended allowances NRC, 2006) plus 10% of each fiber source. The feeding trial was approved by Institutional Animal Care and use Committee at Kansas State University Research Compliance Office. Cats, 12 American shorthairs, were group-housed but fed individually in cages during 9-d adaptation and kept individually caged during the 5-d collection period. Animals were fed twice daily in a replicated Latin square design, with water available throughout the experimental period. Diets and feces were analyzed for proximate analysis and acid insoluble ash (AIA); additionally, apparent total tract digestibility (ATD) and urine pH were computed. Data was analyzed using statistical software (SAS v9.4) using the GLM procedure. Cats maintained body weight throughout the duration of the study (average 4.6 kg). Food intake, defecation frequency, fecal scores, and urine pH were not different ($P < 0.05$) (average 374.8g*d^{-1}, 1.2*d^{-1}, 3.1, 6.94, respectively). The DM and OM digestibility of BP were greater ($P < 0.05$) than for cats fed MG or CE for both TFC (DM; 81.14, 76.22, 75.45%, OM; 85.85, 80.47, 79.37%, respectively) and AIA (DM; 71.18, 69.54, 61.98%, OM; 77.5, 74.46, 67.49%, respectively) methods. The CP digestibility was not different among treatments for TFC (average 85.34%) and for AIA greater ($P < 0.05$) for MG than CE with BP intermediate (81.18, 74.59, 78.21%, respectively). The EE digestibility by TFC were similar for MG and CE and each greater ($P < 0.05$) than BP (89.15 and 89.64 vs. 84.96%, respectively) and by AIA there was no difference among the treatments (average 82.15%). While differences in ATD observed the values for MG were within the range of those for CE and BP for both methods of assessment. Miscanthus grass appears to be an effective alternative to BP and CE in high fiber cat diets.

Key Words: fiber, cat, Miscanthus grass, cellulose, beet pulp, digestibility

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0424 The effect of feed form on diet digestibility and cecal fermentation in rabbits. I. C. Alvarenga*[1], C. G. Aldrich[1], and M. Kohles[2], *[1]Kansas State University, Manhattan, [2]Oxbow Animal Health, Murdock, NE.*

Companion rabbits are commonly fed dry forages supplemented with formulated mixes based on finely chopped hay (alfalfa or timothy), grain and grain co-products, vitamins, and minerals. These may be offered as a muesli, a pellet, or extruded into kibbles; but, whether one form is beneficial relative to the other for companion rabbits has not been reported previously. Therefore, the objectives of this experiment were to determine the effects of diet form (muesli, pelleted, or extruded) on rabbit intake, weight, digestibility, and cecal fermentation. Fifteen New Zealand rabbits were randomly assigned to one of 3 treatment groups of 5 animals each and fed pelleted, extruded, or muesli diets in a completely randomized design experiment. Rabbits were placed in individual cages with ad libitum water and food for 45 d. Digestibility was calculated based on results from intake measurements and collection of feces by total collection (TFC) and by two methods for determining acid insoluble ash (AIA) as an internal marker (AIA1; Vogtman et al. (1975), and AIA2; Keulen and Young, 1977). Cecal fermentation was assessed at the conclusion of the experiment by measuring cecal pH, ammonia, and VFA following exsanguination and organ harvest. Feed intake was higher ($P < 0.05$) for pelleted and extruded diets (133.1g/d and 135.0g/d vs. 98.8g/d), but weight change was not different among treatments (average −1.2 g/d). By TFC the DMD of muesli and extruded were greater ($P < 0.05$) than pelleted (69.1, and 65.2 vs. 50.6%). DMD by AIA1 was not significantly different between treatments ($P > 0.05$; 58.1, 55.3, 64.4% for muesli, pelleted and extruded, respectively) and for AIA2 DMD was greater ($P < 0.05$) for pelleted followed by muesli and extruded (71.8 vs.

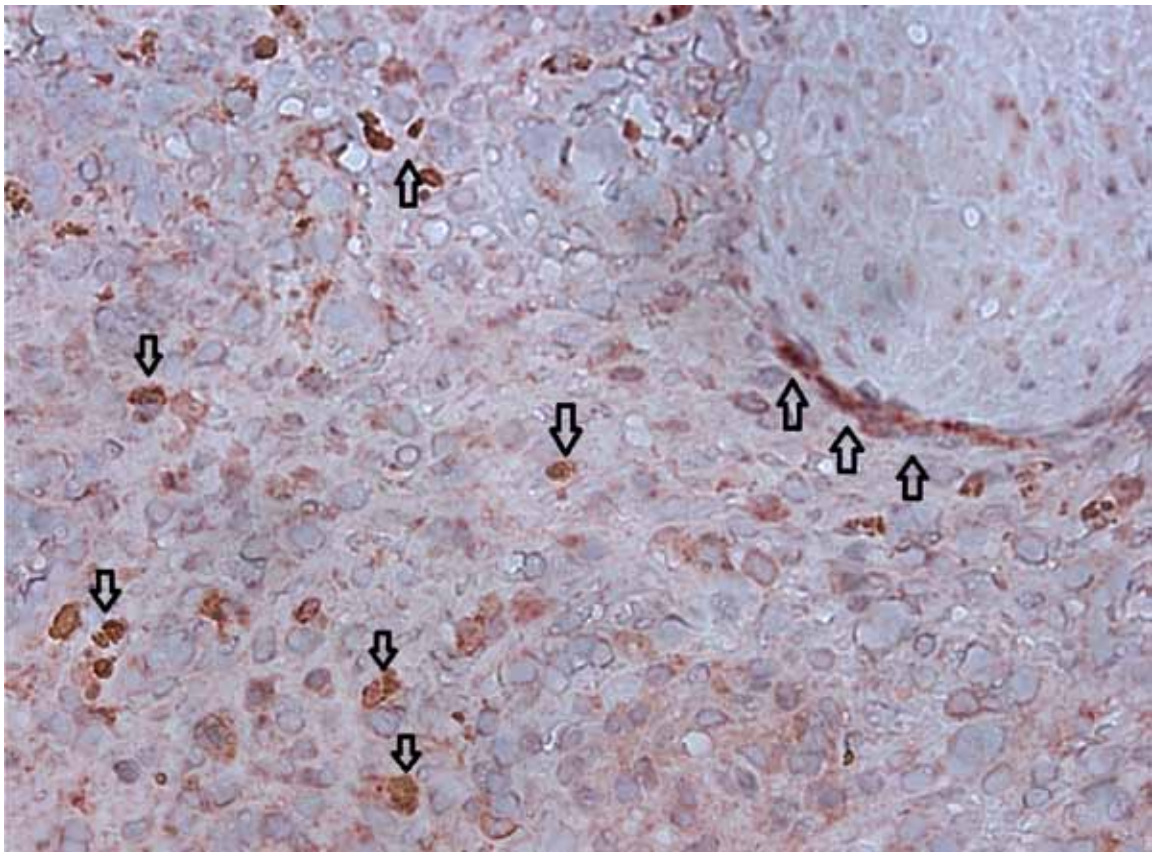
68.5 vs. 62.0%, respectively). Between the two AIA methods the AIA2 had much lower variation among each mean than AIA1 (SEM = 0.44 vs. SEM = 5.37). Rabbits fed pelleted and extruded diets had lower pH ($P < 0.05$) compared with muesli (6.38 and 6.42 vs. 7.02, respectively), the cecal butyrate concentration was higher ($P < 0.05$) in rabbits fed extruded and pelleted diets than muesli (12.4% and 11.38%, vs. 8.4%, respectively), and proprionate was higher ($P < 0.05$) in rabbits fed muesli than pelleted or extruded diets (10.2% vs. 7.7% and 6.6%, respectively). This would indicate higher fiber fermentation for extruded and pelleted diets. These results suggest that diet composition rather than processing had a greater impact on digestion and fermentation.

Key Words: rabbit, AIA, digestibility, extruded, pelleted

0425 Canine hemangiosarcoma expresses luteinizing hormone (LH) receptors. K. Zwida* and M. A. Kutzler, *Oregon State University, Corvallis.*

Throughout most of the developed world, surgical sterilization via gonadectomy has become a common tool for combating the overpopulation of unwanted dogs as well as to eliminate the risk of reproductive diseases in pet dogs. However, canine gonadectomy increases the risk of several non-reproductive long-term disorders, possibly due to a loss in negative feedback to the anterior pituitary, which results in supraphysiologic circulating concentrations of LH. In addition to its reproductive hormone action, LH is a powerful mitogen in extragonadal tissues with LH receptors. Studies have confirmed the presence of LH receptors in vascular endothelial and smooth muscle cells in humans. Hemangiosarcoma is a rapidly growing, highly invasive cancer arising from the lining of blood vessels (mostly commonly the spleen in dogs). Gonadectomized (spayed) female dogs have two times the risk for developing hemangiosarcoma compared with unaltered females. We hypothesized that LH receptors would be present in vascular cells of canine hemangiosarcoma. The aim of study was to investigate if LH receptors were expressed in primary and metastatic lesions of canine splenic hemangiosarcoma using immunohistochemistry. Formalin-fixed surgical biopsies submitted to the Oregon State University Veterinary Diagnostic Laboratory were paraffin-embedded and sectioned (6 μm) onto charged slides. Testicular tissue from a separate dog obtained following castration was used as a positive control. All slides were deparaffinized, rehydrated, subjected to heat-induced epitope retrieval (#S1700, Dako). Endogenous peroxidase activity was inactivated with 3% H_2O_2 and nonspecific binding was blocked with 1% horse serum. Goat polyclonal anti-human LHR antibody (SC-26341, Santa Cruz Biotechnology) was applied at a 1:50 dilution. Negative controls from each tissue were treated in the same way except in absence of primary antibody. Slides were then reacted with biotinylated horse

Fig 0425.



anti-goat IgG (Vector Laboratories, Burlingame, CA) and incubated with preformed avidin-biotin-peroxidase complex (#PK6105, ABC kit, Vector Laboratories) followed by Nova Red Peroxidase substrate (#SK4800, Vector Laboratories). Slides were counter-stained with hematoxylin, dehydrated, and mounted. Images were digitally captured at 400X magnification. LH receptor expression (cytoplasmic and granular) was found in splenic stromal cells of a primary tumor from one dog (identified by arrows on figure) but not in a primary splenic tumor or a mesenteric metastatic tumor from two other dogs. There was no positive staining in the negative sections. This is the first report shows that LH receptors are present in canine hemangiosarcoma and provides evidence for how gonadectomy may increase the incidence of cancer in dogs.

Key Words: dog, gonadectomy, immunohistochemistry

0426 Rabbit maternal pheromone delivered in ointment decreases heart rate in domestic dogs during a simulated thunderstorm. G. M. Pirner* and J. J. McGlone, *Texas Tech University, Lubbock.*

Thunderstorm-related anxiety is common in domestic dogs and is characterized by anxious behaviors such as pacing, vocalizing, or environment or self-destruction. Interomones are olfactory chemical cues released by one species that can elicit behavioral and physiological responses in a second species. Previous studies suggest that interomones can alter dog behavior. This study was designed to examine the effects of a rabbit maternal-neonatal pheromone (2-methylbut-2-enal; 2MB2) delivered via topical ointment on heart rate and behavior of domestic dogs. Twelve dogs of varying age, breed, and sex experienced two treatment ointments applied to the snout: a control ointment with no interomone (CON); or an ointment containing 1 µg/mL of 2MB2. Treatments were assigned using a completely random crossover design with two testing rooms and two treatments. Baseline heart rate (HR) and behavior (standing, lying, pacing, and vocalizing) were recorded throughout each trial. Trials consisted of a 15 min "before" period, at the end of which the designated treatment was administered and a simulated thunderstorm played for 15 min ("during"). This was immediately followed by a third 15-min recovery period ("after"). Data were analyzed using the General Linear Models Procedure of SAS (SAS Inst., Inc., Cary, NC) and Least Squares Means were compared. HR increased 9.5% at the onset of the simulated thunderstorm ($P < 0.05$); however, HR of dogs receiving 2MB2 returned to baseline approximately 5 min into the simulated thunderstorm compared with dogs receiving CON, whose HR remained elevated for most of the 15 min period. Throughout the "during" period, HR of dogs receiving 2MB2 was 13% lower than that of dogs receiving CON ointment (124 ± 4.02 vs. 143 ± 3.95 bpm, respectively; $P < 0.05$). Time dogs engaged in each behavior did not differ between treatments. The interaction between individual and treatment was significant ($P < 0.01$) for HR, indicating that 2MB2 influenced individuals differently. The rabbit maternal pheromone 2MB2 delivered in an ointment to the snout may act as an interomone in dogs, and provides a natural, fast-acting therapy for some dogs experiencing thunderstorm-related anxiety.

Key Words: dog, pheromone, thunderstorm

0427 Evaluation of nutrient digestibility and fecal scores in domestic dogs (*Canis lupis familiaris*) fed raw meat diets varying in protein source. C. A. Iennarella*, C. J. Iske, C. L. Morris, *Iowa State University, Ames.*

Few commercially available raw meat diets (RMD) formulated for exotic carnivores managed in zoological institutions, (typically beef or horse-based), are available. Recently, a 100% pork-based RMD was commercially developed and may provide an alternative dietary option for managing carnivores in the zoological community. The objective of this study was to evaluate the nutrient composition, fecal scores, and apparent total tract macronutrient and energy digestibilities of the pork diet compared with 3 existing RMDs commonly fed to zoologically managed carnivores using the domestic dog as a model. Four intact male dogs (*Canis lupis familiaris*) were utilized in a repeated 4x4 Latin square design consisting of 14-d periods including 10 d for diet transition followed by 4 d of fecal collection. Four raw meat dietary treatments varying in protein source were evaluated and included horse (H), pork (P), and two different beef diets (B1, B2). Diets and feces were analyzed for dry matter (DM), organic matter (OM), crude protein (CP), crude fat (fat) and energy according to AOAC methodology. Feces were scored using the following scale: 1 = very hard, dry feces to 7 = watery diarrhea (Nestle Purina). Dogs were individually fed to maintain body weight and body condition based on energy intake before initiation of the study. Data were analyzed using the mixed models procedure of SAS. Treatment nutrient concentrations ranged for DM (32.2–36.2%), OM (91.1–94.9%), CP (50.3–61.7%), fat (25.1–38.3%), and gross energy (5.8–6.4 Kcal/g). Fecal scores were lower ($P < 0.05$) when dogs were fed H (1.2) and B2 (1.9) diets compared with P (2.7) and B1 (3.1). Digestibility of nutrients and energy ranged from 83.3–92.4%, 88.4–95.3%, 93.8–97.7%, 94.9–98.2%, and 91.3–95.5% for DM, OM, CP, fat, and energy, respectively. Dogs fed B2 had greater ($P < 0.05$) DM (92.4%), OM (95.3%), CP (97.7%), and GE (95.5%) digestibilities but lower ($P < 0.05$) fat digestibility (94.9%) than all other diets evaluated. The results of this study suggest these RMDs were comparable in nutrient composition and apparent total tract digestibility, indicating dogs effectively digest RMDs containing various protein sources. Fecal scores were all 3.1 or less; therefore, RMDs did not result in reductions of digestibility or in diarrhea and all

diets utilized in this study may be effective options for managing exotic carnivores.

Key Words: raw meat diets, dogs, exotic canids

0428 Miscanthus grass utilization as a dietary fiber source for dogs. R. Antunes Donadelli*, C. G. Aldrich, and I. C. Alvarenga, *Kansas State University, Manhattan.*

Pet foods formulated to aid weight loss by energy reduction may include high levels of fiber (8 to 10%). This fiber may be added as beet pulp (BP), cellulose (CE), or other crop residues. *Miscanthus giganteus* (MG) is a purpose grown C4 grass that produces large quantities of fiber. However, there is no published data supporting the use of MG in dogs. The hypothesis of this study was that MG would be utilized as a fiber source similar to CE and BP in dog diets. Each experimental diet contained 10% test fiber and 90% basal ration (chicken byproduct meal, brewers rice, corn, wheat, corn protein concentrate, minerals, and vitamins) to meet the recommended allowance according to NRC (2006). The experimental protocol was approved by Institutional Animal Care and use Committee at Kansas State University. Twelve Beagle dogs (average weight 10.6 kg) were housed individually in metabolism cages in environmentally controlled rooms and fed experimental diets for 14 d (9-d adaptation and 5-d collection) in a replicated Latin square design. Diets and all feces (TFC) were analyzed for proximate analysis and acid insoluble ash (AIA) and apparent total tract digestibility (ATD) was computed. Data were analyzed with statistical software using the GLM procedure (SAS v9.4). Food was readily accepted by all dog and each maintained weight throughout the study. There were no differences in defecation frequency, but fecal scores (1 = soft, 5 = hard and firm) were lower (softer; $P < 0.05$) for BP (3.15) than MG (3.63) or CE (3.68). Dry fecal excretion was estimated at 46.9 and 63.1 g*d^{-1} for TFC and AIA, respectively. The DM and OM digestibility were greater ($P < 0.05$) for dogs fed BP than MG but less than those fed CE for TFC (DM; 81.32, 78.0, and 77.21%, OM; 86.06, 82.12, and 80.81%, respectively) and AIA (DM; 76.55, 72.20, 68.92%, OM; 81.58, 76.68, 73.56%, respectively). The CP digestibility was greater ($P < 0.05$) for MG than BP and CE for both TFC and AIA methods. The EE digestibility was greater ($P < 0.05$) for the MG and CE than BP for both TFC and AIA. The AIA method predicted nutrient digestibility with similar magnitude and rank to TFC. Further, differences among treatments for ATD occurred among treatments the results indicate that MG is a viable dietary fiber alternative to CE and BP in dog foods.

Key Words: fiber, dog, Miscanthus grass, cellulose, beet pulp, digestibility

429 The effect of milled sorghum fractions on diet utilization by dogs. I. C. Alvarenga*, C. G. Aldrich, and R. A. Donadelli, *Kansas State University, Manhattan*

Sorghum is an abundant starch source that has many potential health benefits. Some pet food companies have adopted whole sorghum in their formulations, however sorghum flour and (or) its seed coat which is rich in polyphenolics might provide added benefit to companion animal diets. The objective of this experiment was to evaluate diets utilizing sorghum flour (SFD), and sorghum mill feed (SMF) relative to whole sorghum (WSD), and conventional grains (rice, corn and wheat; CON) in a typical dog diet. Adult (1–3 yr) Beagle dogs ($n = 12$; 10.6 kg ± 1.4) were randomly assigned to individual pens with ad libitum access to water. Dogs were fed twice daily and adapted to diet (9 d) then feces and urine were collected for 5 d over 4 periods in a replicated Latin square design. Fecal excretion was estimated using Cr_2O_3as an external marker and apparent total tract digestibility was computed. Number of defecations and feces were scored on a subjective 5-point scale (1= runny, 5 = hard and dry). Results were analyzed with statistical software using GLM procedure of SAS (v 9.4). Dry matter digestibility (DMD) was greater ($P < .05$) for SFD than CON and WSD, which were greater ($P < 0.05$) than SMF (86.0, 83.0, 81.1, and 65.9%, respectively). The organic matter (OMD), energy (DED), and protein (PRD) digestibility followed a similar relationship among treatments (OMD 90.7, 88.1, 86.4, and 70.06%; DED 90.3, 87.2, 85.4, and 70.2%; PRD 81.8, 77.5, 77.2 and 67.2%, respectively). In contrast, fecal scores were highest ($P < 0.05$; 3.91) for SMF, intermediate for the WSD and SFD (3.74 and 3.77) and lowest ($P < 0.05$) for CON (3.58). As well the number of defecations per day was higher ($P < .05$) for SMF than all the other treatments (3.03 vs. average 2.21). While SMF may contain some beneficial phenolic compounds it decreased nutrient digestibility and yielded firmer stools relative to the other treatments. Mostly due to the higher fiber content of this milled sorghum component. In contrast, removing the fibrous cortical layer resulted in higher digestibility for SFD and may provide beneficial functional properties to modern pet food kibble.

Key Words: sorghum, pet food, digestibility, flour, mill feed