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Schedule

9.30  Registration – tea / coffee

10.00 Opening by Mr John Sinclair, Dean of Faculty of Arts, Science & Technology, University of Northampton.

10.05 Keynote speaker: Dr Sandra McCune: Feeding for behavioural enrichment.

10.45 F Susca. From the gut to the brain and back: a two-way connection for improving pet well-being.


11.15 Break – tea / coffee

11.45 W McCormick. How do human choices influence the feeding of their dogs?

12.00 A Empert-Gallegos, S Poole, PS Yam. Feeding raw: Insights into dog owner perspectives.

12.15 K Livesey, S Chapman. The relationship between feeding routines of dog owners in the UK, their perceptions and food-related problem behaviours in dogs.

12.30 Speed networking

1.00 Lunch & posters

2.00 J Ritchie, W McCormick. Legal compliance of pet food manufacturers producing complete vegan diets for sale in the UK.

2.15 J. Boyd, S Itle-Clark. “Don’t use the F word!” promoting prosocial practices in animal nutrition advising; An applied strategy to support caregivers in enhancing animal wellbeing.


2.45 ML Whitehead. Periodontal disease, calculus, tooth fractures and periapical disease in wild, zoo, feral and domesticated carnivores.
3.00  *B Hunt*. Effect of feeding practices on defecation and satiety behaviours in dogs.

3.15  Break – tea / coffee

3.30  Round table discussion: Feeding for behavioural wellbeing.

4.30  Close.
Keynote speaker

**Dr Sandra McCune**  
*Director of ANIMAL MATTERS*

Sandra qualified as a registered veterinary nurse before completing a degree in zoology from Trinity College, Dublin. She has a PhD in cat behaviour and welfare from the University of Cambridge. Until recently, Sandra was a scientific leader for Mars Petcare, part of Mars Inc. She has studied a range of companion animal topics including aspects of temperament, behaviour, cognition and welfare, and Human-Animal Interaction (HAI). She has collaborated with researchers from the USA, UK, Austria, Germany, Australia and Brazil and has communicated internationally on companion animals and their relationship with people. For 12 years, she led the Human-Animal Interaction area at Mars and established them as the industry’s thought leader in this field. She was instrumental in the establishment of the public-private partnership between the National Institutes of Health and Mars/WALTHAM focused on child development and HAI. She now leads the ANIMAL MATTERS consultancy providing expert input on a wide range of animal issues.

Panel members

**Dr Christine Huggett**  
*Founder & Director, The Pet Food Consultant*

Christine’s interest in animal nutrition started over 35 years ago, with the acquisition of her first rabbit and a copy of J. C. Sandford’s “The Domestic Rabbit” borrowed from the local library! Keen to learn more she set about studying and graduated from the University of Nottingham with an Honours Degree in Animal Sciences, followed by a PhD in Nutritional Biochemistry.

She joined the pet food industry in 1993 (celebrating 26 years last year), and during this time has worked for several multinational pet food manufacturers (Mars, Supreme Petfoods, IAMS Company, Procter & Gamble and Spectrum Brands) and also independently as “The Pet Food Consultant”. Though most of her time has been spent in Research & Development (R&D), designing, formulating and developing diets, she has also gained valuable experience from Quality Assurance, Regulatory Affairs, Intellectual Property, and more commercial and strategic brand-facing Consumer & Market Research roles. She draws on knowledge and expertise in all these functional disciplines within her current role as consultant.

Over the years Christine has been an active member of several pet industry associations, including PFMA, FEDIAF and VHN (the Swiss Pet Food Association) and the Pet Care Trust (as it was then). Whilst working predominantly in the arena of dog and cat nutrition, her expertise and passion for rabbits and rodents has also been recognised. Christine was once described as “The UK’s Leading Rabbit Nutritionist” (The Times, 2006), served as chairman of the FEDIAF Small Pets Working Party, has had advice columns in Fur &
Feather (the journal of the British Rabbit Council) and Rabbiting On (the journal of the Rabbit Welfare Association), and has been invited to talk at many events over the years – the most recent being an Animal Health industry event where she covered the emotive topic of Health and Welfare of Pet Rabbits.

Christine is a member of the European Society of Veterinary and Comparative Nutrition (ESVCN), and is an Honorary Lecturer at the University of Nottingham delivering lectures on The Pet Food Industry, Comparative Animal Nutrition, Ruminant Nutrition, Companion Animal Nutrition, and of course Rabbit Nutrition. She is also a presenter on the PFMA Pet Food and Nutrition Training Course, and amongst other topics, covers behavioural enrichment in the Small Mammal Nutrition section.

Ms Amanda Ferguson
Diet Management Officer, Zoological Society of London

Amanda’s interest in nutrition was sparked whilst studying Animal Science at University. This was followed by a job at the Zoological Society of London in the Nutrition Department investigating fatty acid profile and fat soluble vitamins of milk. Amanda then transferred into the zoo as an animal keeper, working with a large variety of taxa over the next twenty years before joining the Curatorial Team. For the last eight years Amanda has been responsible for developing and running the animal feeding programme at ZSL London and Whipsnade Zoos; over 700 species, from killifish to elephants! This includes the formulation of nutritionally appropriate diets as well as planning presentation methods to encourage the expression of a natural behaviour repertoire with the aim of improving and health and welfare. A particular focus is optimal feeding practice for animals in conservation programmes such as Partula snails, corncrakes, mountain chicken frogs and common dormice.
Presentation abstracts
FROM THE GUT TO THE BRAIN AND BACK: A TWO-WAY CONNECTION FOR IMPROVING PET WELL-BEING.

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The digestive tracts of dogs and cats harbour a complex community of microorganisms, the microbiota that exerts a positive and vital effect on host health. The complex interactions between the microbiota, the host immune system and genetics influence the balance between health and disease. Genetics, age, environment, antibiotics and diet are some of the factors recognised to be able to affect the gut community.

It is a well-known fact that gastrointestinal (GI) disorders are associated with altered microbial communities within the gut, but it is now increasingly documented that disorders beyond the GI tract such as obesity, central nervous disorders, atopic dermatitis, etc... can also be linked to changes in the microbiota. The crucial role of the microbiota within the brain-gut communication axis has been demonstrated, as well as its role in anxiety behaviour. The potential of probiotics to influence this brain-gut axis is a growing field of evidence. The first animal study was published in 2006 (Zareie et al., 2006), and a few years later the first human studies were published showing that a probiotic supplement can effectively alleviate both physiological and psychological symptoms of chronic stress (Diop et al., 2008; Messaoudi et al., 2010). To date, more than 50 published studies have evaluated the link between probiotic supplementation and the brain-gut axis. The brain-gut axis is certainly one of the newest and most promising areas of research in microbiota and probiotics. All the studies presented in this presentation pave the way for new holistic approaches to modern pet well-being issues by targeting the gut microbiota.

References

DIET AND FEEDING FOR WELLBEING: EARLY FINDINGS FROM GENERATION PUP.
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Generation Pup is a longitudinal cohort study, investigating risk factors for a range of health and behavioural outcomes in dogs. This includes data on diet and feeding behaviours which may influence a range of outcomes at different life stages. Here, descriptive data from 476 dogs with complete datasets at both 7 and 12 months old are presented, including initial findings on body condition scores (BCS) and husbandry practices linked to obesity. In addition, logistic regression models investigating risk factors associated with two owner behaviours previously suggested to be important in canine obesity (feeding table scraps and frequency of feeding chews) were built using survey data from 720 dogs aged 12 months. Descriptive statistics and Cohen’s kappa co-efficient for agreement between owner-reported and veterinary-reported BCS were assessed, while gamma coefficients were used to assess association between age and factors such as use of food-filled toys and feeding human food scraps. Of the 720 dogs, 488 received a chew more than once per week, while 379 received table scraps. For dogs aged 12 months, only 11% had a BCS>5 (based on a 9-point scale) and minimal agreement existed between owner-reported and veterinary-reported BCS (kappa=0.29). Multiple dogs in a home increased (p=0.011, OR 1.54; 95% CI=1.11-2.14), and dogs having been neutered decreased (OR 0.69; 95% CI = 0.495, 0.973) the odds of feeding chews more than twice/week. Having children in the home significantly reduced the odds of owners feeding table scraps (p= 0.004; OR 0.56; 95% CI=0.377-0.833). Food-filled toy use declined in dogs between 7 and 12 months (γ=-0.166), suggesting possible missed opportunities for enrichment in the older dogs. However, use of chews were commonplace and may have provided alternative enrichment opportunities. Low prevalence of BCS>5 suggested diets were balanced for energy intake; however, habits being formed by owners in this period (e.g. feeding human food scraps) could be a factor in weight.
HOW DO HUMAN CHOICES INFLUENCE THE FEEDING OF THEIR DOGS?
WD McCormick

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With more than 9 million dogs estimated in the UK we can still call ourselves a nation of dog lovers and this has been reflected by a changing status of our pet dogs into members of the family, our ‘fur-babies’. As such, it is hardly surprising that the choices behind how we feed our pet dogs have started to reflect the ways in which we choose to feed ourselves and our family members. This study explored these factors with the aim of identifying areas of concern regarding the welfare of dogs. Via online survey, more than 33,500 usable responses were received from UK dog owners spanning an extensive range of breeds and ages. This presentation will explore the relationships between the main protein sources of human and dog diets, the incidence of homemade diets rather than commercial, and some of the factors reported as being key to owner decision making. In particular, it gives the first estimates of the scale of not only vegan dog diets but also full carnivore diets in the UK. The subsequent areas of concern regarding dog health will be discussed.
Feeding a raw meat-based diet (RMBD) to dogs is of increasing interest to owners and veterinarians alike. Many studies have looked into the pathogenic and nutritional aspects of RMBDs, yet scant research has been conducted on why owners choose to feed RMBDs. The objective of this study was to survey dog owners about the motivations behind their chosen feeding method, their opinions on RMBDs, and their awareness of the associated risks. Data were collected using an anonymised web-based survey distributed to dog-centric Facebook groups and 421 owners responded. When asked about benefits and risks of RMBDs, respondents provided opinions via free-text boxes; the most repeated words were “better, health, raw, teeth, and natural” for benefits and “raw, bacteria, risk, Salmonella and contamination” for risks. Respondents were asked to rate their own knowledge of canine nutrition; 85.9% of raw feeders gave themselves 4 or 5 out of 5 while only 65.2% of cooked feeders gave similar scores. When asked to rate their veterinarian’s knowledge of canine nutrition, only 45.5% of raw feeders answered 4 or 5 out of 5, compared to 78% of cooked feeders. Respondents were also asked questions about risks of RMDBs to both human and animal health with results showing that owners who feed RMBDs perceive them as less risky to human and dog health than owners who feed cooked diets; all respondents ranked cooked dry or wet commercial diets as relatively low risk to humans. This survey revealed that raw feeders perceive their veterinarians to be less knowledgeable about nutrition than non-raw feeders, and demonstrated a large gap in understanding and acknowledgement of the accepted pathogenic risks of feeding RMDBs. Further education and improved communication is paramount in this area.
Current information on feeding practices of dog owners in the UK and its impact on dog eating behaviour is inconclusive and outdated. The Animal Welfare Act (2006) states feeding a suitable diet and exhibition of normal behaviour as needs required for optimum animal welfare. This suggests that both what owners feed and how they feed it can lead to compromised welfare. Various authors in countries outside the UK have established a relationship between dog feeding routines and canine eating behaviour. Owner lifestyles and perceptions may be different in the UK compared to the rest of the world, which may impact upon canine feeding practices and problem eating behaviour. The current study aimed to determine if the way owners feed their dogs in the UK affects dog eating behaviour. Using a mixed methods questionnaire, information was obtained from 231 dog owners with a total of 357 dogs regarding current feeding practices of dog owners in the UK and their dog's eating behaviour. Aspects of dog feeding routine were analysed for association with problematic eating behaviours. The incidence of feed-related aggression was statistically higher in dogs fed together as opposed to separately ($X^2=0.001$, $p<0.05$) and dogs that were fed treats during the owner’s mealtime ($X^2=0.007$, $p<0.05$). The incidence of stereotypical behaviour was lower when feeding enrichment was provided. Problematic eating behaviour is concerning for dog owners. It is hoped that findings from this study may be used to educate owners on ways they may be encouraging problematic eating behaviours in their dogs and how to prevent this.
Commercial animal feed in the UK falls under the control of the European Food Standards Agency and can only consist of approved feed materials (ingredients) and approved additives. A pet food marketed as ‘complete’ must by law contain all requirements for the animal to have a healthy life, this includes vitamin D. Vitamin D is proving to be a challenging nutrient with complete vegan dog food diets. The only approved form of vitamin D as an additive is D3 (cholecalciferol) which is derived from the lanolin of sheep fleeces, and therefore is not vegan. D2 (ergocalciferol) which is derived from plants was formerly approved but withdrawn from the register and could no longer be used after July 2019. An alternative additive form of active D3 (calcitriol) has been identified from some plant sources, and would comply with the term vegan, but is not currently approved for use in animal feeds.

This project made direct contact with companies marketing complete vegan dog (or cat) food diets to determine exactly what form of supplementation they were using and whether this complied with the relevant legislation. Following online information searches in August 2019, six companies were contacted and asked to respond by online questionnaire in September 2019. Of these, only one responded to the request so results were based upon packet labelling for the remaining. One company exhibited a good example of appropriate labelling, however there were potential issues found with the remaining five that could raise concerns for either consumer rights or, more importantly, for animal welfare. This project raises the question of how companies are responding to changes in pet feeding trends and who in the industry is acting as a watchdog for compliance.
Providing nutritional advice and support to animal caregivers is a significant part of a pet food manufacturer’s role and responsibility. Any advice provided should be scientifically robust, nutritionally correct, supportive of “best-practice” animal management conventions and intended to promote both animal wellbeing and a positive interaction between caregiver and pet. Current evidence suggests that there is a persistent rise in reported levels of companion animals with obesity and associated weight management issues. Consequently, while much advice provided by pet food companies to pet caregivers will relate to nutritional management, other holistic topics including lifestyle, management, exercise and activity levels are also integral to promoting a healthy bodyweight for their companion animals. On this basis, there is a responsibility for pet food companies to ensure advisory staff are suitably trained in the theoretical delivery of nutrition and associated information to customers. However, a clear tension exists in providing that nutritional advice in a supportive, empathetic, compassionate, and respectful way, while also ensuring a positive and sustainable outcome in terms of animal wellbeing and meeting commercial obligations.

Prosocial practices relate to the implementation of the principles of humane and prosocial education within programmes intended to promote prosocial behaviour, relating to social justice, moral reasoning, social and emotional constructs and civic engagement. From an animal welfare perspective, humane and prosocial education programmes have been significant at promoting improvements in management practices and attitudes towards animals with an emphasis on empathy, respect and compassion.

This presentation will review the value of taking a prosocial, supportive approach in nutritional advising for pet caregivers. Strategies for training advisory staff and enhancing end-user implementation will be discussed from a case study perspective, including how empathy increases client satisfaction and helps with avoidance of judgmental or emotionally loaded terms, such as the “fat” word!
Phosphorus (P) is an essential nutrient, and present in pet foods as so-called “organic” forms in animal and plant-origin raw materials, as well as supplemented inorganic P (iP) salts. Recently, studies have confirmed that diets with high iP content can negatively impact feline renal health (Alexander et al., 2019). The speed of absorption, and therefore post-prandial changes in plasma P levels, were hypothesised to be a contributing factor in the development of the renal changes observed. To investigate this, an in vivo model was employed to assess the post-prandial kinetics of plasma P concentration. Following exposure of cats to a single meal and subsequent serial blood samplings, primary measures of plasma P, ionised calcium (iCa) and parathyroid hormone (PTH) were analysed. Effects of the diets fed to cats in the Alexander et al. (2019) study, as well as different P sources, levels of P, and more recently a systematic investigation on the effect of Ca:P ratio were studied (Coltherd et al. 2019; Bakke et al. 2019), and will be summarised. These investigations have provided insights into measures that can be taken to help ensure feline kidney health. Source and levels of dietary P, and Ca:P ratios are important factors. Setting safe upper limits for dietary iP should be considered by regulatory and advisory agencies.

References

PERIODONTAL DISEASE, CALCULUS, TOOTH FRACTURES AND PERIAPICAL DISEASE IN WILD, ZOO, FERAL AND DOMESTICATED CARNIVORES.

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Pet dogs and cats have a high prevalence of periodontal disease (PD) that increases with age. Raw feeders have argued that PD is a consequence of processed pet foods, and would be greatly reduced by feeding a more natural raw diet containing intact bones, such as whole carcasses, ‘raw meaty bones’ or ‘BARF’ diets. That view suggests that wild or feral carnivores eating their natural diet should have much less PD than domesticated dogs and cats. Others are concerned that diets containing intact bone may increase tooth fractures, and so periapical disease, in pets. This review compares the published evidence regarding PD, tooth fractures and periapical disease in wild, zoo, feral and domesticated carnivores.

Studies of pet dogs, laboratory beagles, laboratory ferrets, and zoo wolves and tigers indicate that feeding intact bone sufficiently often reduces plaque, calculus and grade 1 PD (gingivitis of the gum margin around the teeth).

In skulls of wild canids, felids and polar bears, high-grade PD, tooth fractures and periapical disease are highly prevalent. For skull specimens, cause of death and age at death are usually unknown. However, life expectancy of most wild canids and felids is lower than that of pet dogs and cats, and the evidence suggests that the prevalence of PD in wild canids and felids is not any lower than in pet dogs and cats of similar age. Feral cats eating wild-caught prey have a high prevalence of high-grade PD, tooth fractures and periapical disease.

In conclusion, oral pathology is probably a common cause of mortality of wild and feral carnivores, and the comparative evidence suggests that feeding pet dogs and cats natural, ‘species-appropriate’ raw-meat diets containing intact bone, instead of processed diets, may reduce plaque and calculus, but may not prevent moderate to severe periodontal disease, and may increase tooth fractures.
EFFECT OF FEEDING PRACTICES ON DEFECATION AND SATIETY BEHAVIOURS IN DOGS.

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Results will be presented from three studies that examined the effect of feeding practices on defecation patterns, faecal quality and satiety in dogs.

Seventy-five neutered dogs (35 males and 40 females) aged between one and two years of age, from eight breeds (Golden Retriever, Labrador, Flat Coat Retriever, Border Collie and Italian Spinone or crosses of these breeds) were studied. Dogs were housed in kennels and fed high-quality kibble either once or twice daily in a cross-over study design. The number of times fed per day had no significant effect on number of defecations per day, mean faecal weight per dog per day, total faecal weight per dog per day or faecal quality (p>0.05). Results demonstrated inherent variation in the number of times per day that each dog defecated; 52.0% of dogs varied by ≥2 defecations each day. Some dogs considered to be defecating inappropriately could be within the limits of their ‘normal’ behaviour.

To investigate the impact of feeding practices on satiety, 23 normal healthy entire breeding bitches (Labrador, Golden Retriever or crosses of these breeds) housed in a breeding kennels were recruited to one of two groups: DSK bitches (n=12) were fed dried vs soaked kibble in a cross-over study for 7 days; OT bitches (n=11) were fed once or twice per day in a cross-over study for 7 days. Data collected on feed duration, feeding behaviour and from three behaviour tests; 1) self-control, 2) gaze and 3) distraction tests indicated that DSK bitches fed dried kibble had higher distraction scores when compared to dogs fed soaked kibble (p>0.05). For OT bitches, feeding once per day showed a trend towards increased vocalisations, arousal and dog interactions, suggesting the dogs were less satiated. Improving satiety may reduce the presence of begging, scavenging and food seeking behaviours, which are undesirable behaviours for working dogs such as Guide Dogs.

Results will be of interest to pet dog owners, nutritionists, working dog organisations and rehoming centres.
Poster abstracts
EVALUATION OF EXTRUSION PROCESSING IN CANINE DIETS, AS INFLUENCED BY DIETARY PROTEIN SOURCE.

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Extrusion processing is widely utilised in the pet food industry and although effects of this technology on the nutritive value of livestock feed are well documented, there is less established information for pet foods. The aim of the current study was to evaluate the effects of precisely controlled extrusion processing on apparent nutrient digestibility and performance, utilising a typical pet food approach of formulating on a total protein basis. Protein sources commonly used in pet food manufacture (dried salmon meal, salmon protein hydrolysate and maize gluten) were evaluated in diets with/without extrusion processing using a broiler chick assay fed to six replicate cages of birds. On Day 23, birds were euthanised and performance parameters determined, along with collection of ileal digesta and samples of Bicep Femoris, Semimembranosus / Semitendinosus and Gastrocnemius for subsequent muscle evaluation. Results showed average daily feed intake (ADFI) was greater for birds fed non-extruded diets (P=0.007) and although significant effects of processing on performance were observed, extrusion effects appeared largely influenced by the dietary protein source. There was no clear processing effect alone on ileal digestibility of amino acids but there was an interaction between processing and dietary protein (P=0.009). Leg muscle weights were unaffected by any of the dietary treatments. The results of the current study suggest the effect of extrusion processing on amino acid availability could be allowed for in future canine diet design if diets are formulated to better suit amino acid requirements, rather than formulating on a total protein basis, which assumes sufficient excess to allow for processing loss. Careful monitoring of processing variables is required during pet food manufacture such that there can be better allowance for extrusion effects.

MAINTAINING MUSCLE AND JOINT INTEGRITY: THE BENEFITS OF MELON JUICE RICH IN SUPEROXIDE DISMUTASE

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Joints and muscles are key elements in the performance of competition horses. Intense physical activity is often underestimated as a major source of oxidative stress, which is linked to excessive production of reactive oxygen species (ROS); an inflammation source, which impairs the resistance of the horse’s muscles and joints. Oxidative stress leads to an exacerbated inflammatory response that can jeopardise the natural regeneration of damaged tissue. In equids, oxidative stress, which is very common in working horses, is recognised as often being associated with the weakening of the membranes of muscles and joints. Intense physical exercise leads to micro-trauma that will damage the ultrastructure of muscle fibres and encourage local infiltration by white blood cells (onset of the inflammatory response), rapidly leading to a state of oxidative stress. 2 groups of horses (n=8) undergoing normalised intense exercise (measured on the basis of heart rate) were studied with and without the supplementation of a dried melon juice product naturally rich in superoxide dismutase (SOD), to investigate the effects on plasma and synovial fluid biomarkers of inflammation, oxidative status, cartilage integrity and muscle integrity before (-24h) and after (+1, +24h) exercise. Prostaglandin E2 and Nitric Oxide concentrations within synovial fluid were decreased (p=0.02; p<0.1 respectively) after exercise, reflecting a reduction in inflammation status for treated horses. The stimulation of antioxidant defences within synovial fluid of treated horses was reflected by a global increase in antioxidant status and increased SOD activity (p=0.1). Gycosaminoglycan concentration within synovial fluid decreased (p=0.1) after exercise for treated horses, symbolic of the maintenance of cartilage integrity, whilst the maintenance of muscle integrity was symbolised by a decrease in Creatine Kinase (p=0.01), Aspartate Aminotransferase and Gamma Glutanyltransferase (p=0.1) muscle enzymes within plasma. This shows that the trialled melon product seems to be an effective mechanism against oxidative stress occurring after intense physical exercise.

YANG HELPS IMPROVE DOGS’ NATURAL DEFENCES AND DIGESTIVE WELL-BEING.

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Yeast derivatives are well known for their beneficial effects in helping to balance intestinal microflora and helping stimulate the host’s natural defences. Research shows that the modulation of the immune system differs according to the strain of yeast as well as the production process used. The use of single strain yeast fractions (SsYF) such as mannan-oligosaccharide based products is gaining momentum in feeds thanks to their proven effect on mucosal response and general health. As a logical next step in functional yeast based additives, the synergistic alliance of specifically selected derivatives of inactivated yeast strains with distinct morpho-functional features (YANG; 2 Saccharomycyces cerevisiae and 1 Cyberlindnera jadinii)
was explored, with the hypothesis that contrasted yeast cell structures would act as multi microbe-associated molecular patterns (MAMPs). These MAMPs should interact with an enlarged set of pattern recognition receptors compared to SsYF and induce distinct and specific downstream signalling pathways. In vitro investigation using canine faecal inoculum treated with undigested residues from a pre-digested extruded diet, found significant drops in pH 6 hours (p<0.05) and 24 hours (p=0.1) after incubation when YANG was included in the diet. Increases in *Bifidobacterium* spp. and *Lactobacillus* spp. are seen after 6 hours of incubation, whilst significant increases (p<0.05) are seen after 24 hours. Fresh faecal samples from 2 groups of dogs (n=8) fed the same extruded diet for 28 days; with one fed YANG as a treatment group, were taken at 21 days and 28 days after the first feeding. IgA content was higher (p<0.1) in faecal samples taken from YANG fed dogs, confirming an immunomodulatory capacity of YANG. A reduction in faecal pH was also seen after 21 days (p<0.001) and 28 days (p=0.1) incubation, reflecting a potential reduction in colonic luminal pH. Subsequently, YANG seems to have a positive influence on canine faecal microbiota.

**EFFECTS OF FOOD QUALITY ON THE DAYTIME ACTIVITY LEVELS OF THE DOMESTIC RABBIT.**

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Hypothesis: the higher the food quality given at initial feeding, the less active rabbits will be through the remainder of the day.

With the focus of many domestic species moving to enrichment, an easy form of enrichment for pet rabbits is to spend more time eating. In order to do this without the risk of obesity and health problems, though, they need to be accessing only large amounts of low-nutrition, high fibre food.

Naturally, wild rabbits eat a large amount of low-quality, fibrous vegetation and the majority of their time is spent feeding. However, in captivity, they have access to far more “easy” calories in the form of complementary, commercially produced food. In fact, many pet rabbits are fed so much of this high-nutrition food that, not only are there issues with obesity, but even animals of a healthy weight are not eating much of the long fibre (e.g. hay) that they need to maintain their dental health by wearing down their teeth. If they can be encouraged to spend more time eating lower nutrition food to achieve the same calorie levels, this will not only maintain a healthy weight and optimum dentition but also prevent boredom.

This study used the protein content of the food as the marker of nutrition. Wild rabbits select the forage with the highest level of digestible protein to graze on first when given
the choice (Somers et al., 2008), and show changes in food preference over time relating to the nutritional make up of different plant species through the seasons rather than availability (Soane, 1980). This would suggest that protein, rather than calorific content alone, is the driver of satiety.

A set weight of each food (part of the normal diet of the rabbits involved so as not to cause any gastrointestinal issues) was given in the morning, then scan sampling taken of behaviour through daylight hours using an ethogram based on Gunn & Morton (1995). At the end of this period, the remainder of their normal daily diet was given. There was also constant access to water and unlimited hay. The foodstuffs varied in protein content, which is being used here as the measure of how nutritious a food is.

Subjects were two mixed sex, neutered pairs of rabbits.

References


EVALUATION OF AMINO ACID DIGESTIBILITY IN EXTRUDED CANINE DIETS, DIFFERING IN PROTEIN AND STARCH SOURCE, USING A BROILER MODEL.

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Sustainable sourcing of raw materials while responding to consumer demands for high quality products is a balancing act for the pet food industry. There is a perception among many pet owners that raw, or minimally processed, ingredients such as protein hydrolysates are more beneficial to companion animals compared to heavily processed ingredients (e.g. meat meal or fish meal). Additionally, it is perceived that vegetable starch, e.g. from tubers or legumes, is superior to that from cereal grains. This experiment evaluated three extruded canine diets, differing in protein and starch source, to assess apparent ileal digestibility of amino acids (AA) using a broiler chick assay. Major ingredients in Diet 1 were salmon meal and wheat, Diet 2) salmon meal and potato and Diet 3) salmon protein hydrolysate (SPH) and potato. Day old male broiler chicks (n = 36) were group-housed from Days 1 – 14. On Day 15 birds were paired and allocated to one of three experimental diets, with six replicates per diet. On Day 23 birds were slaughtered and ileal digesta samples collected and frozen (-20°C)
for subsequent analysis. Diet and digesta samples were freeze dried and dry matter (DM) and ileal amino acid contents were determined using an AA Analyser (Biochrom Ltd, Cambridge). Acid Insoluble Ash (AIA) was used as an inert marker to determine Coefficients of Apparent Ileal Digestibility (CAID) and Content of Ileal Digestible Amino Acids (CIDAA). Results indicated a significant protein source effect with CAID values for SPH significantly higher (P<0.05) for Cys, Lys, Thr, Gly and His, and significantly higher CIDAA (P<0.05) for all AAs compared with salmon meal. Starch source was also significant; potato having significantly higher (P<0.05) CAID and CIDAA for all AAs evaluated. The combination of salmon meal and wheat (diet 1) resulted in the lowest ileal AA digestibility values compared with the other two diets (P<0.05). This study suggests that diets based on SPH and potato starch may improve ileal amino acid digestibility. However, more research incorporating more replications, isonitrogenous diets and standardised ileal digestibility or total tract digestibility would be required to further investigate or confirm these findings.

A QUESTION OF COMPROMISE: AN ANALYSIS OF OWNER DECISION MAKING IN UK PET FEEDING PRACTICES.

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Pet ownership represents a valuable industry; with around 9 million dogs, 7.5 million cats, and 200,000 horses being some of the most popular domestic animals in the UK. Domestic animal nutrition is therefore important from both animal welfare and commercial perspectives. The present study aimed to investigate how owners chose what to feed their pets and whether there were any potential animal welfare concerns associated with this. The study utilised an online survey consisting of 48 questions, regarding owner and animal demographics, attitudes, and behaviours which may have influenced the nutritional health and welfare of their pet.

A total of 710 respondents completed the questionnaire, 268 with respect to their dog, 277 to their horse and 165 to their cat. There were strongly significant differences between the three species and how important their owners ranked palatability ($X^2(2) = 79.052, p<0.001$), affordability ($X^2(2) = 21.454, p<0.001$) and nutritional content ($X^2(2) = 115.7, p<0.001$) of a feedstuff.

Pet food purchasing decisions seemed to vary across owner demographic, and formal animal welfare education appeared to influence owner attitudes towards pet nutrition. Nearly half of respondents reported using their veterinarian as a source of feeding information for their pet, though more than half of the animals only received a health check from a veterinarian once a year or less. Overall, there are some concerns
regarding pet feeding practices in the UK, which could be mitigated by targeted educational programs.

THE SOURCING OF FEEDER ANIMALS FOR SNAKES KEPT IN THE UK.
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The popularity of reptile keeping is apparently on the increase in the UK, with the PFMA Pet Population 2019 estimating 200,000 snakes being owned, and yet limited attention has been given to how owners source the vertebrate prey items that they feed. The purpose of this study was to empirically examine which species of snake pet keepers, breeders and trained employees kept, where they obtain their feeder animals from and what influences this decision. The objective was to not only establish a picture of the trade but to distinguish if the feeder animals being sourced and the factors affecting sourcing differed between the those who kept snakes commercially versus for pleasure. It was hoped that his may start towards developing understanding of the challenges that may be faced not only for providing appropriate diets but also for the welfare of the feeder animals. Participants (n=651) completed a 29 item online survey, available publically over a 152-day period. The majority of participants were pet keepers who kept popular common pet species and fed rodents that were sourced from pet shops. The predominant reasons cited for the choice of food source were convenience and cost. The results also showed that more specialist species including giant and venomous species were predominantly kept by pet keepers rather than trained zoo, college or shop employees.

A PROSPECTIVE OBSERVATIONAL WEIGHT LOSS TRIAL, IN 90 PRIVATELY OWNED DOGS, USING A COMMERCIALLY AVAILABLE LOW-CALORIE FORMULA.
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Objective: To determine the effectiveness of a newly formulated low-calorie diet in achieving weight loss in dogs.

Sample Population: 90 privately owned dogs recruited through the first opinion clinics of Bishopton Veterinary Group.
**Methods:** Patients with a Body Condition Score (BCS) > 5/9 (WSAVA, 2013) were invited to participate. Target weight was determined using the proviso that every BCS point above 5 represented a 10% body weight excess. The starting dietary calorific intake was calculated at 60% of Resting Energy Requirement (RER). Participants were weighed at the veterinary practice every 14 days by a trained operative and the rate of weight loss was monitored to ensure that the target rate of weight loss of 0.5-2% of bodyweight/week was not exceeded.

**Results:** 13 dogs did not start the trial due to the presence of abnormal blood results. Of those that started, 59% completed the trial by either reaching their target weight or completing the 6 month feeding regime. Failing to participate for a full 6 months was the most common reason for not completing (n=15/31), and missing more than 2 consecutive weigh-in sessions was the second most common (n=9/31). 84% (41/46) of dogs that completed the trial achieved their target weight. It took between 2-24 weeks for dogs to reach their target, with the mean time being 9.11 weeks and a median result of 7.0 weeks.

**Conclusion:** VetSpec® Superlite Low-Calorie Formula® provides a safe and effective means of achieving target weight in overweight dogs.

**Clinical Significance:** Obesity in UK privately owned dogs is a significant issue with approximately 46% of dogs presented to veterinary surgeries described as overweight or obese (PDSA PAW report, 2019). The successful use of this commercially available diet to achieve target weight in obese dogs in a real world setting is very encouraging.

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**AN EVALUATION OF THE NUTRIENT AND METABOLISABLE ENERGY CONTENT BETWEEN DRY, WET AND RAW DOG FOODS**

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Controversy surrounding ingredients contained in canine pet foods has continued to rise, along with the media claiming raw feeds are the only ‘natural’ feed. This has meant the popularisation of feeding raw foods increasing by 64% since 2015 (Morgan et al., 2017), although little research has been completed on their effect on canine health (Sandri et al., 2016). The aim of this study was to evaluate the nutrient components and metabolisable energy content differences between dry, wet and raw dog complete feeds and how closely they met the National Research Council’s (NRC) recommendations (National Research Council, 2006).

The sample within this study consisted of 15 complete dog foods from each feed category; dry, wet and raw. Information on product labels was used to assess the
protein, fats, nitrogen free extract, crude fibre and energy content of each feed. Significant differences were found between protein content \((p=0.0001)\) and fat content \((p=0.0001)\) of feeds. However, all feeds met minimum NRC recommendations. Nitrogen free extract content \((p=0.0001)\) and metabolisable energy content \((p=0.004)\) was also significantly different between each of the feed categories. In addition, daily metabolisable energy based on recommended amounts fed on the packaging, for several of the complete raw feeds fell short of the NRC daily recommendations.

Daily energy intake variation between the complete feed types raises the question if the pet food industry needs to do more to align labelled recommendations so dog owners can make a fair comparison. Furthermore, the significant constituent differences found between feed types means dog owners need to be better informed about the make-up of the complete feed, energy contained and fed so best choice decisions can be made for maintaining the health and well-being of their dog.

References

TACKLING THE RISKS OF SALMONELLA CONTAMINATION IN KIBBLE PRODUCTION THROUGH INNOVATIVE EQUIPMENT DESIGN AND SMART FACTORY LAYOUT
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Between January 2017 and December 2019, the FDA issued a total 96 product recalls for animal food; just under one third of these recalls were related to Salmonella contamination (FDA, 2019). The Centers for Disease Control and Prevention estimate that Salmonella causes around 1.35 million infections; 26,500 lead to hospitalisation and 420 cause death in the United States every year (CDC, 2019). "Typically, pet foods are extruded or processed at high temperatures that are sufficient to reduce pathogenic bacteria. However, the possibility for post extrusion contamination still exists." (Huss et al., 2017)

Despite publicity and recalls surrounding contaminated animal food, Salmonella continues to present a genuine threat to both humans and animals. However, solutions
and improvements exist that can be implemented within the production process. Frazer-Nash presents a topic review about the latest developments in clean air conveying and smart factory layouts that can be used to minimise the risks of contamination – specifically at the post extrusion stages of kibble production.

The poster provides a basic introduction to potential ways in which Salmonella contamination can occur. It provides an insight into how the technology works and alternative systems that are available. In conclusion, it provides a summary of the risks and benefits of implementing these styles of system.

References


INCIDENCE OF PATHOGENIC ORGANISMS IN DIFFERENT VARIETIES OF A COMMERCIAL RAW MEAT-BASED DOG DIET.

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Over the years the number of households in the UK that own a dog has increased dramatically and alongside this, so has the popularity of owners opting for a raw meat-based (RMB) diet for their companion animals. It has been identified that RMB diets may be contaminated with pathogens and can pose a risk to both animal and human health. Humans can come into contact with these pathogens either directly from food itself or from faecal shedding of the dog. Antimicrobial resistance is a huge concern in human medicine as antibiotics can become ineffective in fighting pathogenic strains and as such, it is important to understand how people may be exposed to them. The purpose of this study was to investigate the presence of pathogens in commercial RMB diets for dogs. Two different meat varieties of the same brand of frozen commercial RMB diet were analysed to identify the different pathogenic species present and the relative colony counts, with a focus on Listeria spp., Salmonella spp., E.coli and Campylobacter spp. By identifying any differences between the two varieties it will be possible to determine whether some meat sources provide a lower risk of pathogen contamination, and therefore may be a preferred choice in households where there is greater concern of zoonotic risk, i.e. where individuals are
immunocompromised. The results will also be presented in relation to levels shown in
meat from the human food-chain to allow comparison of risk.

CELL-BASED MEAT FOR COMPANION ANIMALS? DOG AND CAT OWNER
ATTITUDES TO FEEDING CELL-BASED MEAT AND OTHER ALTERNATIVE
PROTEINS
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Conventional meat-based pet food accounts for more than a quarter of all animal-
derived calories in the US, where approximately 163 million companion dogs and cats
consume 30 percent of all calories derived from animal meat (Okin, 2017). In the UK,
45 percent of households own pets (PFMA, 2018), mostly dogs and cats who consume
meat at least twice a day. The meat in pet food is making a significant contribution to
the environmental problems associated with intensive animal agriculture and is a
source of “ethical feeding friction” (Ward et al., 2019) for many pet-owning vegans and
vegetarians. In the human food space, cell-based (or ‘cultured’) meat has been posited
as a possible solution to reducing the animal-meat consumption of those unwilling
switch to plant-based diets. Given additional barriers to transitioning pets (especially
obligate carnivores) to plant-based food (Dodd et al., 2019), it is hypothesised that
cultured meat - provided it delivers on its promise to be nutritionally identical to
conventional animal meat - could offer an even more convincing alternative in the pet
food space. While there are an increasing number of studies on human willingness to
consume cell-based meat, attitudes to feeding pets these novel proteins have yet to
be formally investigated, despite the existence of three cell-based meat pet food start-
ups. Using a quantitative survey of 729 cat and dog owners across the globe and
qualitative analysis of their long-form commentary, beneficial information about the
nuances of pet owner attitudes to feeding their companions cell-based meat have
been discovered. These findings are discussed, including the impact of variables such
as owner's personal diet, gender, veterinary or non-animal profession and age. Owner
attitudes to other meat alternatives such as plant-based and insect-based food are
also discussed.

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• Okin, G. S. (2017) Environmental impacts of food consumption by dogs and cats. PLOS One,
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BEHAVIOURAL IMPACT OF FEEDING A CALMING HERBAL BLEND TO ENGLISH FOXHOUNDS.
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Nutraceuticals designed to promote calming in pets are often promoted using testimonial rather than scientific evidence due to a non-essential requirement for sale. This means there is often little to no evidence of efficacy in the species the product is targeted at. This study aimed to examine the impact of a calming herbal blend (CHB) consisting of Matricaria chamomilla, Melissa officinalis, Verbena officinalis and Scutellaria lateriflora on dogs, Canis lupis familiaris. CHB was fed to thirty male English foxhounds daily for 28 days following a control week. Group behaviours were analysed via observation of overnight CCTV footage. Scan sampling at sixty second intervals was used to collect data continuously for the same six-hour period daily over six days, both in the control week and the final week of the trial. Additionally, stranger approach tests were carried out within these weeks to compare the groups’ behavioural responses during the day. Paired t-test results indicated a statistically significant reduction in overnight play and agonistic interactions within the group and increased rest behaviours, which suggested a “calmer” pack. Meanwhile, stranger approach tests revealed a statistically significant increase in the number of hounds in the outside kennel area during the day in the trial week compared to the control, as well as a significant increase in the number of hounds approaching the kennel front. On first appearances this behaviour could be interpreted as contradictory to overnight observations. However, it is possible that increased rest overnight led to a more alert pack during the day when approach tests were carried out. Future research should aim to incorporate physiological measures to allow further interpretation of the behaviours observed. Results of this study suggest there may be a calming benefit of feeding the CHB to dogs experiencing stress or anxiety, however further research is needed.

CANINE NUTRITION: ATTITUDES AND PURCHASING DECISIONS, AS INFLUENCED BY OWNER AGE.
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The landscape of the commercial pet food sector is currently undergoing significant change, partly in response to owners who are becoming increasingly conscious of factors such as ingredient selection and origin, food preparation and environmental footprint in their own diets, and are seeking similar criteria in the diet of their pet. Recognising the changing market drivers and increasing human consumer demands in relation to pet food products, the objective of this study was to gain a better understanding of current dog owner attitudes and purchasing decisions related to canine nutrition. A researcher-mediated questionnaire consisting of both qualitative and quantitative questions was used to interview dog owners (n = 152) at a country park in the East Midlands. Owners were asked about their purchasing decisions and attitudes towards the use of raw food diets, ‘novel’ ingredients and dietary supplements, along with more general views on dogfood labelling. Owners with either young or older animals reported a much greater inclination to read the labelling of their dog’s food (P=0.028) and results revealed an association (P<0.05) between consideration of using novel ingredients/supplements and owner age, with older owners less likely to consider feeding them. A range of positive and negative attitudes were apparent in relation to the feeding of raw diets, with older owners more likely to feed their dog a diet in this form, although there were wider challenges reported in terms of hygiene and perceived lack of feeding guidelines. In summary, the results of the current study suggest older owners may have a more traditional view towards canine nutrition whereas younger owners might be more open to adapting their feeding approaches. It is also apparent there is scope for better provision of owner advice around raw feeding, and a more general need to ensure clarity in dog food labelling.
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*Research carried out at Bishopston Veterinary Group, North Yorkshire.

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