RAW EXPERT

Nutritional training package

Module 4

Natures Menu: Veterinary Division

4. Nutrition and Health

The role of nutrition in maintaining good health

Nutrition plays a key role in good health and can also be used to help manage a wide variety of health complaints. In this module we will discuss the impact of nutrition on general health and look at specific recommendations for some common conditions. Where necessary, we will refer to published literature to support the science behind the advice and a full list of references with some further reading can be found at the end of the module. It is important to note that raw diets are not currently offered as prescription diets, this module simply acts to highlight the potential of raw/natural nutrition within a variety of common conditions. We would also like to stress that the information in this module should never be used as a substitute for veterinary advice. If a pet is unwell, we would always recommend the owner seek veterinary attention in a timely manner.

Topics covered are as follows:

- Early development and growth
- Senior health
- Obesity
- Dietary sensitivities (allergy and intolerance)
- Dental health
- Anal glands
- Skin complaints
- Arthritis
- Strictly under veterinary advice: can help diabetes, pancreatic disease, epilepsy, some forms of diarrhoea, urinary disease, cognitive dysfunction and hormonal imbalances.

Early development and growth

Objectives when feeding a young animal are:

- ✓ Healthy growth
- ✓ Good immune function
- ✓ Minimise obesity
- ✓ Prevent developmental orthopaedic disease
- ✓ Optimal trainability

Growth rates of young dogs are affected by breed, nutrient density of food and the amount of food fed. Feeding for maximal rather than optimal growth increases the risk of skeletal deformities and obesity whilst decreasing longevity. The common perception that 'big is beautiful' when it comes to puppies in particular is very dangerous, as the larger puppies with the most rapid growth rates will be more prone to debilitating joint problems later in life.

The requirements for all nutrients are increased during growth compared with adults. Most nutrients supplied in excess cause little to no harm, with some exceptions such as energy, which can lead to obesity, and calcium which can lead to skeletal abnormalities. During the first weeks after weaning, growing puppies use about 50% of their total energy intake for maintenance and the remainder for growth. The recommended minimum protein content in foods intended for growth is 25% on a dry matter basis (DM); there is no maximum as high levels have not been shown to be detrimental. Most commercial foods for puppy growth contain more protein than is needed. Minimum protein content for kittens is recommended to be higher, at least 30% DM.

Dietary fat provides essential fatty acids (EFAs), a carrier for fat-soluble vitamins and a concentrated source of energy. EFAs are essential for neural, retinal and auditory development as well as being shown to improve trainability in puppies (Kelley, et al., 2004). As there is no dietary need for carbohydrates in a dog or cat diets there is no recommended amount for growth.

Senior health

Definition of senior

Generally, companion animals are classed as senior when they enter the final third of their expected lifespan. Because of the huge variation between our pet cats and dogs, it is not accurate to class every animal over eight years old as 'senior' for example, a St Bernard at the age of seven could be classed as senior due to their average life expectancy of nine years of age. In contrast, a miniature Dachshund at eight years old would not be classed as senior due to their average lifespan of twelve years. When it comes to cats, many cats begin to demonstrate signs of ageing as early as eight years old but many will continue into their late teens and sometimes even early twenties. The aim of feeding senior animals is to slow or prevent the progression of metabolic changes associated with ageing however, care should be taken as many pets will have the additional complication of clinical disease associated with old age. Both older cats and dogs can suffer a number of age-related issues such as dental disease, loss of teeth, arthritis, obesity, inappetence and general lack of energy. All of these common problems may be eased or sometimes even prevented when fed a nutritionally balanced, species-appropriate diet.

Dogs

Dogs generally require 15-20% less energy than that of a younger dog of similar body weight when they are approaching old age. There is normally notable reductions in physical activity and lean body mass due to a lower metabolic rate. Some older dogs will have reduced digestive activity accompanied by a reduced appetite, whereas others may start to become obese due to their natural energy levels decreasing. Importantly, nutrient requirements remain the same into the senior years and a reduction of food must not compromise on nutritional value. There is also no evidence that healthy older dogs require different levels of vitamins and minerals to that of young, healthy dogs.

Cats

As cats reach their senior years, their energy requirements also decline. Obesity however, is comparatively rare in older cats and they are usually found to be significantly underweight due to a decline in digestive function, especially of protein and fats which provide the younger cat with energy. Most cats can compensate well with an attentive owner and will self-increase their intake of food but increasing the food intake is not always the best option, as a more energy dense diet may be more appropriate.

Cats require high levels of protein within their diets when leading a normal, healthy lifestyle but when entering into old age, some cats may suffer from digestive issues where protein metabolism is impaired. Restricting protein is not the answer as this will lead to many other problems, such as muscle wastage, so it is important to use a diet where the protein is of high quality, easily digestible and of high biological value. Hyperthyroidism is a typical disease seen in senior cats; typified by a ravenous

appetite alongside rapid weight loss (much to some owners' confusion!) Long periods of inappetence can also occur in senior cats (especially those with dental disease) and as a consequence they can suffer severe liver problems (e.g. hepatic lipidosis). Therefore the dietary needs can be very varied amongst seniors, and optimal nutrition must always be targeted towards the needs of the individual.

Obesity

An animal is classed as obese when the bodyweight is 15% or more than is recommended and it is the most common form of malnutrition within the UK. There are many animals who compensate well when they are obese but clinical issues can occur, some of which may not be noticeable to the average pet owner, such as;

- Osteoarthritis
- Respiratory disease
- Exercise intolerance
- Diabetes mellitus
- Circulatory problems
- Lowered immune response
- Liver disease
- Dermatological problems, especially in cats when self-grooming becomes an issue
- Feline lower urinary tract disease
- General anaesthetic and surgery risk

Obesity is the result of energy intake exceeding energy output and leads to the deposition of fat in adipose tissue throughout the body. Increase in fat cell size is referred to as hypertrophy while an increase in fat cell numbers is referred to as hyperplasia, which occurs in young growing animals. It is therefore vitally important that growing animals do not have an excess intake of energy if they are not expending it, as puppies and kittens who suffer from hyperplasia have a lifelong predisposition for excessive weight gain. The initial dynamic phase of fat deposition is followed by a static phase in which the animal remains fat but its bodyweight remains fairly stable.

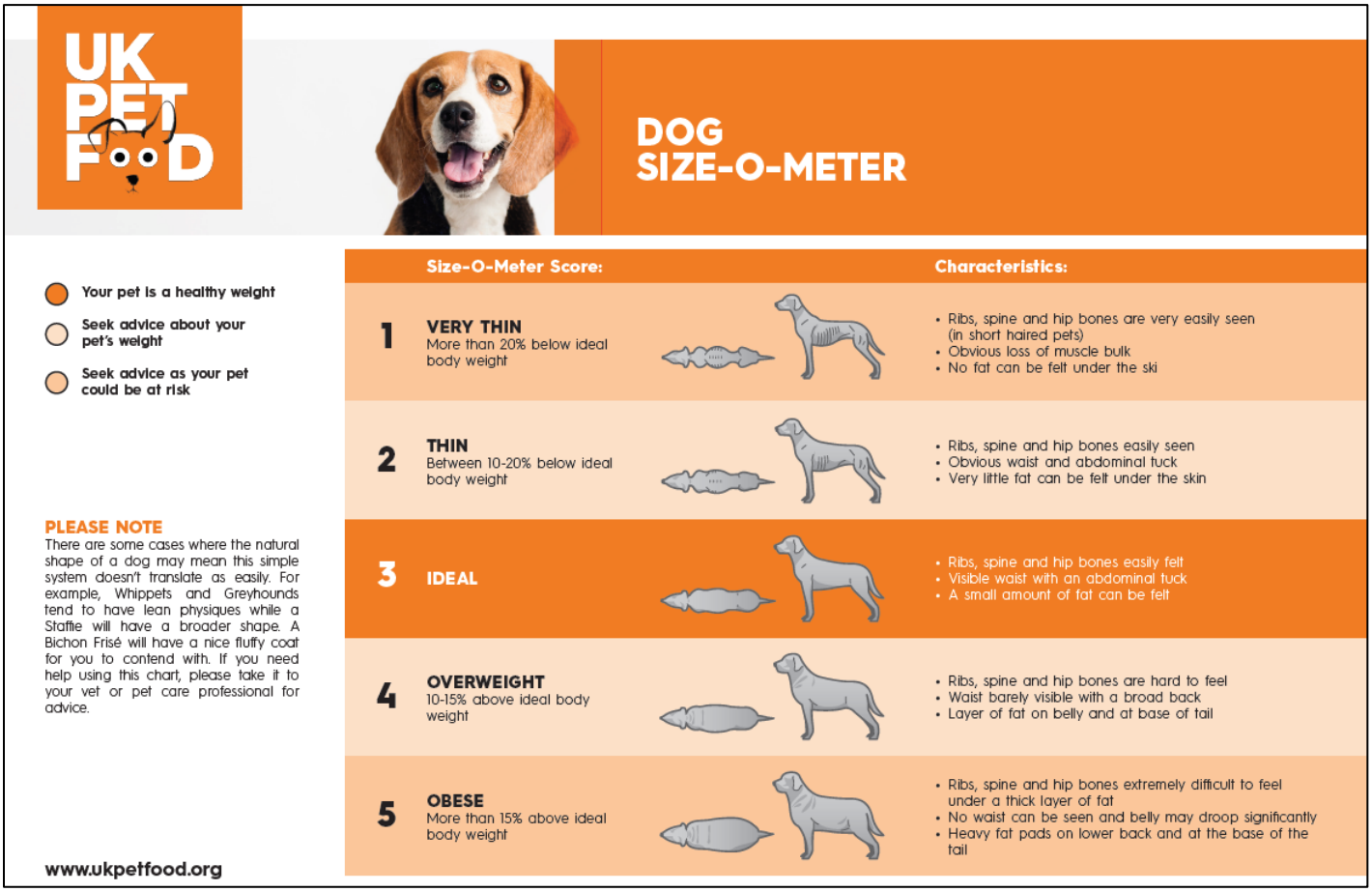
A normal weight for an animal will depend on the breed, species and sex. Breed standards can be referred to for purebred dogs and cats, although this is not helpful for crossbreeds. A healthy sized average animal should not have clearly visible ribs but they should be easily palpable when placing your hands on the rib cage under a thin layer of fat i.e. you should not have to press your fingertips into the animal's side to be able to feel ribs. A waistline should also be visible just behind the ribcage where the body should 'nip-in' to form a normal, healthy body shape from above. Dogs tend to accumulate fat around their tail base and can sometimes develop a fat roll over this area which can lead to

dermatological issues and/or anal gland problems. Cats tend to gain an 'apron' of fat around their groin area which can be seen swinging from side to side in some obese cases when the cat walks. Body condition scoring is a vital measurement for management of obesity.

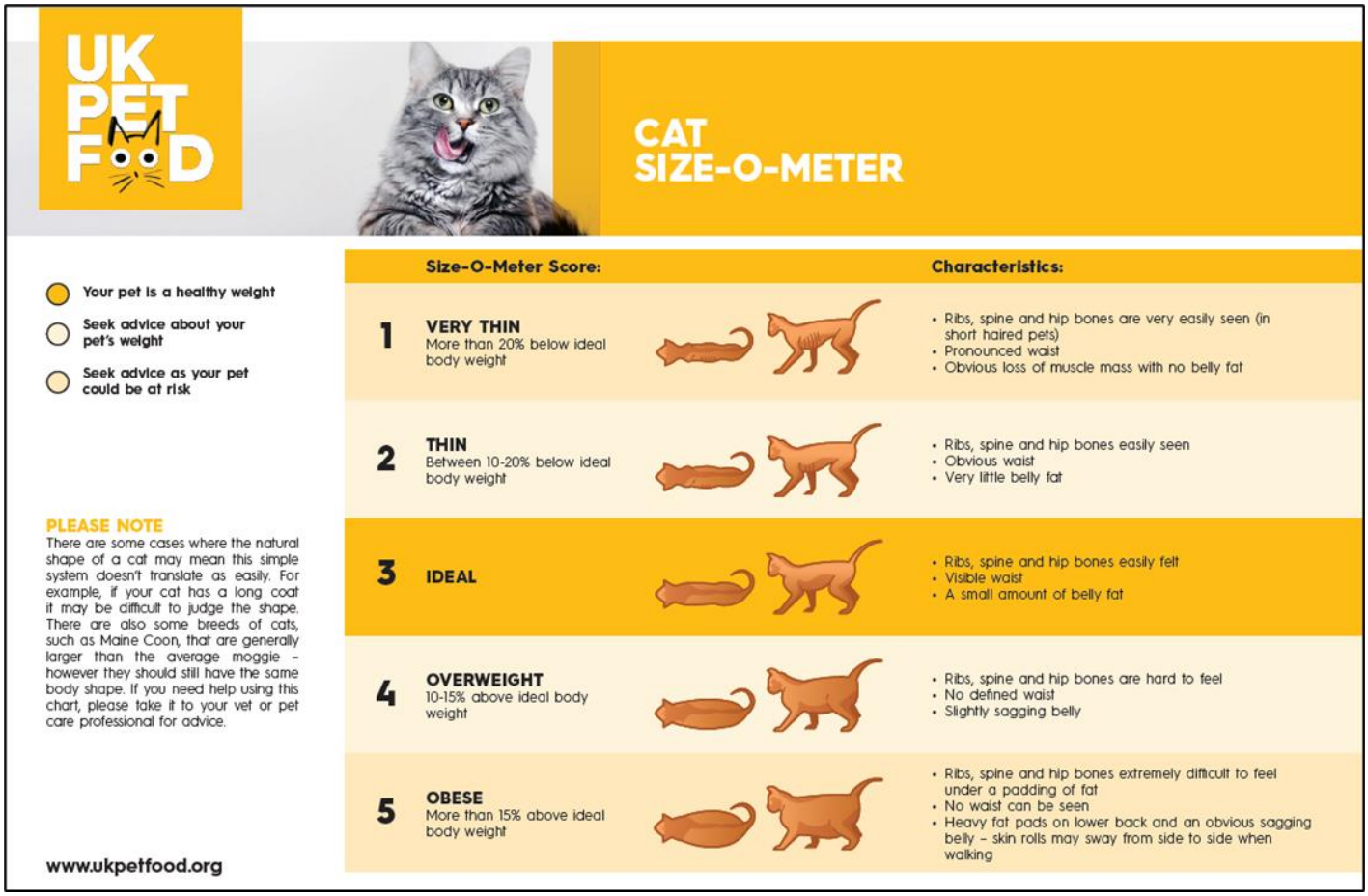
It can be incredibly hard for some owners to hear that their pet is overweight or obese and occasionally, the news can cause such emotional upset, customers to stop using certain pet services and find an alternative. Informing customers that their pet is overweight should be performed with sensitivity and empathy and UK Pet Food have designed a range of tools which have proven useful in tackling this sensitive subject. Their specially designed pet-size-o-meters have been given to over 200,000 pet owners through rescue centres each year since their release and have proven incredibly popular and a great way for owners to assess their pets in the privacy of their own home, seeking professional help and advice when needed.

Together with many useful factsheets and tools for owners, the pet-size-o-meters are available to download for free at UKPetFood.org and examples of the dog and cat sizing charts can be viewed below;

DOG



CAT



In addition to the cat and dog charts, there are also weight charts available for guinea pigs, rabbits and even parrots for those professionals who deal with all species, together with food diary templates, a family pet pledge to help keep everyone involved and weight logs.

Data from UK Pet Food research suggests that as many as one in three pets in the UK are obese, with 74% of vets believing that pet obesity levels are increasing. Mirroring the human obesity epidemic in the developed world, pets are not far behind. In multiple studies, higher protein and lower carbohydrate diets have been shown to be more effective in pet weight loss. In one study, cats fed a higher-protein diet lost more body fat while reducing their loss of lean body mass by 50% (Laflamme, 2005). A further study confirmed that increased protein intake favours the maintenance of lean body mass during weight loss in obese cats (Vasconcellos, 2009). The results also suggest that protein may reduce the calorie restriction needed for weight loss. In addition, protein intake appears to act on a

long-term basis, resulting in greater calorie requirements during the subsequent phase of weight maintenance. These aspects are important for successful weight loss and maintenance in cats.

A higher protein: carbohydrate ratio is also known to provide a more stable energy release resulting in less hyperactivity and a more stable blood glucose level. Reduced hyperactivity can also be attributed to foods with less additives, artificial colours and flavours, which are generally not present in raw food diets due to their natural ingredient base.

One study (Raubenheimer, 2015) looked at the evolution of nutrition for humans and correlated the reduction in the consumption of protein-sourced energy with the rise in obesity throughout the developed world seen in humans and companion animals alike. This 'protein leverage hypothesis' suggests that humans and companion animals are better able to naturally regulate their intake of energy from protein sources compared to non-protein sources (i.e. fats and carbohydrates). As a result of the rising costs of protein, our diets have included more non-protein sources which has contributed to the current obesity epidemic.

Care needs to be taken when encouraging weight loss at a rapid speed, as this can lead to severe metabolic problems. Slow weight loss towards an achievable target should be aimed for by feeding for the desired weight, rather than the current weight to help achieve some loss. The amount of food should be decreased gradually to help prevent animals feeling overly hungry. For example, if a dog weighs 30kg and should ideally weigh 20kg, we would advise first feeding for a 28kg dog. Once achieved, then decrease to a 26kg daily amount until achieved and continue to decrease every few weeks until the weight is deemed healthy. Increase in exercise is also key but care should be taken when dealing with excessively overweight animals due to compromised respiratory and heart function. Dogs can be increasingly walked and are easily given extra energy releasing activities such as feeding from a toy or by scattering the food to prevent gobbling. Cats can be more difficult to increase energy expenditure but 'chase-it' toys are always popular and can be combined with running up and down stairs. A diet with a reduced calorie level should be fed to animals wishing to lose weight as reducing a normal, balanced diet can lead to nutritional compromise due to components or levels being removed or decreased. L-carnitine (synthesized from the amino acids lysine and methionine) plays a vital role in fat metabolism and energy production. It is key to weight loss and aids in the retention of lean body mass.

Hypoallergenic diets

Often, Natures Menu are asked if any of our diets are hypoallergenic, and this claim is made by many pet food manufacturers on branding and packaging. In truth, almost any pet food can be potentially classed as hypoallergenic when we look deeper into the meaning of the term. In the Oxford dictionary,

hypoallergenic is termed as *'substances and materials… unlikely to cause an allergic reaction in the person who uses them.'* Therefore, if an animal suffers an allergy to the ingredient chicken, any diet free from chicken could be deemed as hypoallergenic for that particular pet. Similarly, if an animal has an intolerance to corn, any diet free from corn could be classed as hypoallergenic for that individual. Many diets using more unusual proteins, such as rabbit or duck, for their main or single meat source often refer to themselves as being 'hypoallergenic' however, as discussed, diets can only be truly hypoallergenic when they are matched to a particular pet's requirements.

Dietary sensitivities

Dietary sensitivities can be separated into two main clinical problems. **Food intolerance** is a clinically abnormal response to a dietary component which may occur from an impaired ability to digest the specific food type. This could be due to the lack of the digestive enzyme needed to break down this food type or could be a more in-depth problem associated with pharmacological, metabolic or toxic reactions. The other clinical problem seen is a **food allergy** or **hypersensitivity** which is an immune-mediated phenomenon. Both food allergies and food intolerances are very difficult to distinguish due to their similarity in visible symptoms and the treatment approach to both is the same.

Symptoms may include:

- pruritus (itchy skin) which can lead to self-trauma and sores
- otitis externa (ear disease)
- miliary dermatitis (red itchy skin – especially cats)
- eosinophilic plaque in cats (raised, ulcerated lesions, often found on the abdomen)
- diarrhoea
- irritable bowel disease
- idiopathic chronic colitis
- many other uncomfortable problems may be seen within individual animals

The dietary sensitivity can be associated with any ingredient or even additive, but most are caused by protein intolerance (Paterson, 1995). Firstly, the allergen must be identified and eliminated from the animal's diet. If the specific protein source is unidentifiable at this stage, then a diet should be fed containing a protein source which the animal has not been exposed to in the last month, or ideally ever. The trial period for elimination diets is usually around sixty days. If symptoms subside within this time, other single source proteins can be gradually introduced to assess if a reaction is noticeable. This will then enable the owner to decipher which source the pet is intolerant to. A diet which does not contain the allergen is said to be 'hypoallergenic' for that particular individual.

Available research has highlighted that the most common proven allergens for cats and dogs include beef, chicken and dairy products. In one literature review, 278 dogs with food allergy were evaluated and the problem ingredient was clearly identified for each dog. Beef was the most common allergen, being responsible for 95 of the cases reported. Dairy was responsible for 55 cases, making it the second most frequent cause. Corn was identified as the offender in only 7 cases. In cats, the situation is similar. Fifty-six cats were evaluated in this study. Forty-five of the food allergies resulted from eating beef, dairy, and/or fish. Corn, meanwhile, was responsible for only 4 cases.

Dental Health

Many pet owners often associate dry pet foods with improved dental health and wet foods with poorer dental health, but this is often a misconception. Food texture is very important, but the majority of dry kibbles are actually far too soft to have any positive 'teeth cleaning' effect. As the pet bites on a typical kibble it will shatter and crumble providing no mechanical cleaning function (Logan, et al., 2010).

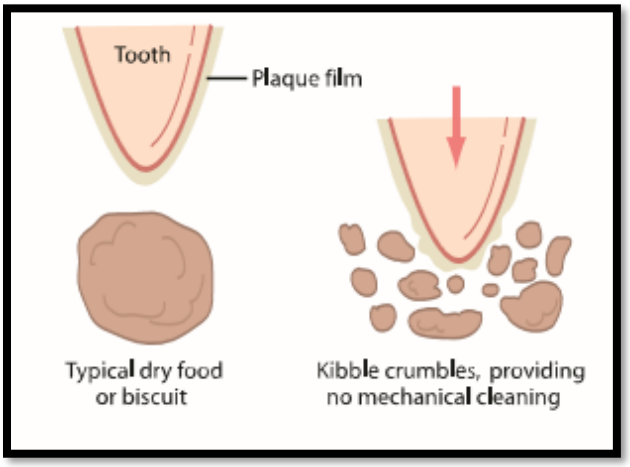


Figure 1: Reproduced from Logan, et al., 2010

Cats and dogs have developed a range of differently shaped and sized teeth for cutting, shearing and grinding actions (see Raw Advisor course for more details on dentition). Providing only a uniform food does not enable full use of their specially designed dentition and can lead to the build-up of dental calculus. Raw meaty bones and chews can provide behavioural stimulation to dogs, but they also require the use of all teeth as they were designed, which can maintain better oral health. Natures Menu's bones & chews staging advice emphasizes the use of a variety of appropriate frozen treats, in

terms of their size and density, to avoid dental damage and potential gastro-intestinal issues, as well as always ensuring suitable training and supervision. Cooked bones should never be fed.

Throughout life we are frequently taught that dental disease and tooth decay occurs as a result of a sugary diet, and it is no different for our pets. Both wet and dry foods can be very high in carbohydrates and sugars compared to raw foods, and these sugars can have the same negative impact on dental health as they would in our own diets. Typical wet foods also differ to raw in their texture; there is often a very sticky quality to the jelly or gravy used in canned and pouch varieties which can frequently lead to plaque formation. In contrast, raw foods often possess a more gritty and abrasive texture due to the ground bone content.

Flatulence and Anal glands

Flatulence

Flatulence is excessive formation of gases in the stomach or intestine and can be a common cause for concern amongst pet owners. It is usually associated with the following three findings:

- Flatus – gas expelled through the anus
- Eructation – noisy voiding of gas from the stomach through the mouth
- Borborygmus – rumbling noise caused by the propulsion of gas through the intestines

While flatus, eructation and borborygmus occur in normal pets, they can often develop as a consequence of digestive disorders. Excessive swallowing of air (aerophagia) is a risk factor for flatulence and is seen with brachycephalic (short-nosed) breeds, working and sporting canine breeds and pets with aggressive and competitive eating behaviours.

Gas in the gastro-intestinal tract is normal and may arise from swallowed air, gases produced by gut bacteria or may diffuse from the blood. Using highly digestible foods is key in the management of flatulence as it reduces the residues available for colonic bacterial fermentation, which is responsible for many of the malodorous gases expelled. Studies in dogs have shown that using rice as a carbohydrate source results in less intestinal gas formation than foods containing more complex, harder to digest carbohydrates, such as wheat or corn (Washabau RJ, et al., 1986). Leguminous protein sources such as soybean meal should be avoided in pets with excessive flatulence (Roudebush, et al., 2010). Protein sources with higher digestibility should be selected, such as those found in raw foods (Crissey, et al., 1999; Murray, et al., 1997). Soluble or fermentable fibre-enhanced foods may contribute to excessive flatulence in some patients, therefore the amount of fibre should probably be limited to no more than 5% DM (Roudebush, et al., 2010).

Carminatives are preparations to relieve flatulence and can be of medical, herbal or botanical origin. An example is yucca, which is thought to decrease faecal aroma.

Anal glands

Disease of the anal glands is a common reason for presentation of dogs to a veterinary surgeon. It is less common in the cat but does occur. Little is known of the aetiology or pathogenesis of anal sac disease, so treatment is often symptomatic. Predisposing factors to anal sac disease are soft stools and obesity (Scarff, 2010).

If simple anal gland impaction is present, action is often taken to try to firm up the stool and allow more natural emptying of the anal sac secretions during normal defecation. Increasing the dietary fibre may help (Scarff, 2010), but raw foods, including ground bone and raw meaty bones, are also well known to produce much firmer stools and also aid in the management and prevention of simple anal gland impactions.

Obesity management is also key to prevent deposition of fat around the external anal sphincter interfering with normal anal sac expression. As discussed earlier, high protein raw food can also offer a great way to manage weight loss and thereby prevent future anal sac issues.

Skin complaints

Disorders of the skin and hair are known to be a very common occurrence amongst dogs and cats. Surveys indicate that 15 to 25% of all small animal veterinary activity is involved with the diagnosis and treatment of problems with the skin and coat (Scott, et al., 1995). There are multiple skin and hair complaints that can arise as a result of a nutrient deficiency, there is also an element of breed predilection. Ensuring an appropriately balanced diet is the simplest way to help prevent such diseases. Providing sufficient quantities of good quality protein is paramount in maintaining healthy skin and haircoats.

Essential fatty acids are commonly used in the management of inflammatory skin conditions. They exhibit multiple anti-inflammatory and immune-modulating properties with the potential to affect allergic skin disease as well as any other inflammatory forms. Dietary sensitivities can often manifest with symptoms of the skin and haircoat. Diet trials with both novel protein sources and novel carbohydrates are easily achieved with raw diets and are still very palatable and easy to stick to. Novel ingredients are vital as the pet has not been exposed to them before and so is unlikely to have been able to develop a sensitivity.

Arthritis

Osteorthritis is the most commonly observed non-traumatic orthopaedic condition of dogs (Clements, et al., 2006). The most common risk factors in dogs are developmental orthopaedic disease, previous trauma and obesity. The extent to which the general population of cats is affected by osteoarthritis remains unknown, but it is thought to be common. One study concluded that 90% of cats over the age of 12 years had radiographic evidence of osteoarthritis (Hardie, 1997). Obesity can both cause and exacerbate osteoarthritis and so obesity management is key to nutritional recommendations.

Omega-3 fatty acid supplementation reduces the body's capacity to produce pro-inflammatory mediators, instead favouring production of mediators with minimal or no inflammatory effect. One study (Hielm-Bjorkman & Virtanen, 2014) found mobility improved in a number of older dogs after starting a raw diet and many have been able to discontinue the use of joint supplements as the diet can offer glucosamine and chondroitin in its natural form.

Under veterinary guidance

Strictly under veterinary guidance, raw food has the potential to help in the management of a wide range of other diseases:

- Some causes of **diarrhoea**, E.g.
    - **Exocrine pancreatic insufficiency** (EPI) – raw offers a very high digestibility
    - **Small intestinal bacterial overgrowth** (SIBO) – raw can positively impact the natural balance of gut bacteria (microbiome)
    - **Colitis** – hypoallergenic options and bone content helps with firmer faeces
    - **Inflammatory bowel disease** (IBD) – highly palatable grain/gluten free options with novel protein and carbohydrate sources
- **Pancreatitis -** Very palatable, highly digestible – must choose lower fat options
- **Diabetes mellitus -** Restricted carbohydrate and sugar content for dietary manage of blood glucose levels
- Some cases of **urinary disease -** High moisture content helps flush urinary tract
- **Cognitive dysfunction** (canine dementia) – Omega-3 fatty acid content well preserved in frozen format and high in antioxidants
- Some cases of **epilepsy -** Completely natural food, often calmer behaviour and can sometimes metabolise drugs more efficiently so lower doses required.

Summary

While the flexibility of raw feeding can prove invaluable in achieving tailored nutritional management for a host of disease processes, we do not intend for it to replace prescription diets and would always recommend dietary changes should be made under the supervision of the treating veterinary surgeon. Here we summarise appropriate recommendations within the Natures Menu range for specific circumstances.

Disease Process	Nutritional Requirements	Product Recommendations	
		DOG	CAT
Early development and growth	✓ Increased energy ✓ Essential fatty acids ✓ Appropriate calcium/phosphorus	➢ Complete & Balanced Puppy Raw Nugget range ➢ Puppy can (wet) ➢ Puppy pouch (wet)	➢ Especially for Cats kitten can
Senior	✓ Less energy ✓ High digestibility ✓ Balanced micronutrients	➢ 60/40 and/or 80/20 Complete & Balanced Raw nugget range ➢ Senior pouches ➢ Light pouches	➢ Especially for Cats adult cans range
Obesity	✓ Less energy ✓ High protein/low carbohydrate ✓ L-carnitine	➢ Light or Senior pouches (wet) ➢ 80/20 Rabbit with Superfoods Raw Nuggets ➢ 60/40 Chicken with Salmon, Veg & Brown Rice Raw nuggets or 300g block	➢ Especially for Cats adult cans range
Dietary sensitivities	✓ Single source, novel protein ✓ Novel carbohydrates ✓ Grain and gluten free	➢ 80/20 Complete and Balanced Raw Nugget Range (excluding Salmon & Chicken, Chicken and Goose & Turkey) ➢ Country Hunter cans (single protein options only) ➢ Country Hunter pouches	
Dental health	✓ Low sugar ✓ Abrasive, non-sticky texture	➢ 60/40 and/or 80/20 Complete & Balanced Raw Nugget ranges ➢ Raw meaty bones/treats (1-3 times per week)	➢ Especially for Cats adult cans range
Flatulence and anal sacs	✓ High digestibility ✓ Reduce aerophagia ✓ Obesity management ✓ Higher bone content	➢ Raw meaty bones (1-3 times per week) ➢ Avoid beef-based nuggets as zero bone content If weight management required; ➢ 80/20 Rabbit with Superfoods Raw Nuggets ➢ 60/40 Chicken with Salmon, Veg & Brown Rice Raw nuggets or 300g block	➢ Especially for Cats adult cans range

Skin complaints	✓ High quality protein ✓ Omega-3 fatty acids ✓ Balanced micronutrients	➢ Complete & Balanced Raw Nugget and 300g block ranges	➢ Especially for Cats adult cans range
Arthritis	✓ Obesity management ✓ Omega-3 fatty acids ✓ Glucosamine and chondroitin	➢ 80/20 Rabbit with Superfoods Raw Nuggets ➢ 60/40 Chicken with Salmon, Veg & Brown Rice Raw nuggets or 300g block ➢ Light or Senior pouches (wet)	➢ Especially for Cats adult cans range

As mentioned, it is vitally important owners take advice from their treating veterinary surgeon when dealing with disease in pets. Incorrect dietary management can have a hugely detrimental effect on health if not addressed correctly and working together with the treating practice can reap benefits for both owner and pet, as well as the pet involved in assisting finding the right diet for them.

References and Further reading

Bennett, Greco & Peterson, 2001. Comparison of a low carbohydrate vrsus high fibre diet in cats with diabetes mellitus. *Journal of Veterinary Internal Medicine,* Volume 15, p. 297.

Bennett, Greco, Peterson & al, e., 2006. Comparison of a low carbohydrate-low fiber diet and a moderate carbohydrate-high fiber diet in the management of feline diabetes mellitus. *Journal of Feline Medicine and Surgery,* Volume 8, pp. 73-84.

Bonnet, Egenvall, Hedhammar & al, e., 2005. Mortality in ovr 350,000 insured Swdish dogs from 1995-2000: Breed-, gender-, age- and cause-specific rates. *Acta Veterinaria Scandinavica,* 46(3), pp. 105-120.

Cameron, Casey, Bradshaw & al, e., 2004. A study of environmental and behavioural factors that may be associated with feline idiopathic cystitis. *Journal of Small Animal Practice,* Volume 45, pp. 144-147.

Clements, Carter, Innes & Ollier, 2006. Genetic basis of secondary osteoarthritis in dogs with joint dysplasia. *American Journal of Veterinary Research,* 67(5), pp. 909-918.

Crissey, et al., 1999. Use of a raw meat-based diet or a dry kibble diet for sand cats (Felis margarita). *Journal of Animal Science,* 75(8), pp. 2154-2160.

Dodd, Zicker, Jewell & al, e., 2003. Can a fortified food affect behavioural manifestations of age-related cognitive decline in dogs?. *Veterinary Medicine,* Volume 98, pp. 396-408.

Fettman, KuKanich & Phillips, 2010. Effects of food on pharmacokinetics. In: *Small Animal Clinical Nutrition.* Topeko, Kansas: Mark Morris Institute, pp. 1196-1207.

Frank, Anderson, Pazak & al, e., 2001. Use of a high-protein diet in the management of feline diabetes mellitus. *Veterinary therapeutics,* Volume 2, pp. 238-246.

German, 2006. The Growing Problem of Obesity in Dogs and Cats. *Journal of Nutrition,* 136(7), pp. 19405-19465.

Guengerich, 1995. Influence of nutrients and other dietary materials on cytochrome P-450 enzymes. *American Journal of Clinical Nutrition,* 61(Suppl.), pp. 651-658.

Hamper, et al., 2012. The unique nutritional requirements of the cat: a strict carnivore. In: Little, ed. *The cat: clinical medicine and management.* St Louis: Elsevier Saunders, pp. 236-242.

Hardie, 1997. Management of osteoarthritis in cats. *Veterinary Clinics of North America: Small Animal Practice,* 27(4), pp. 945-953.

Hielm-Bjorkman & Virtanen, 2014. Exploratory study: 632 shared experiences from dog owners changing their dogs' food to a raw food (BARF) diet.

Hoenig, Alexander & Pazak, 2000. *Effect of a high- and low- protein diet on glucose metabolism and lipids in the cat.* s.l., Purina Nutritional Forum, pp. 98-99.

Kelley, Lepine, Burr & al, e., 2004. *Effect of dietary fish oil on puppy trainability.* s.l., s.n.

Kossoff, 2004. More fat and fewer seizures: dietary therapies for epilepsy. *The Lancet Neurology,* 3(7), pp. 415-420.

Laflamme, 2005. Increased dietary protein promotes fat loss and reduces lean body mass during weight loss in cats. *International Journal of Applied Research in Veterinary Medicine.*

Logan, Wiggs, Schert & Cleland, 2010. Periodontal Disease. In: Thatcher, Remillard, Roudebush & Novotny, eds. *Small Aimal Clinical Nutrition.* Kansas: Mark Morris Institute, pp. 989-1001.

Maguire, Fettman, Smith & al, e., 2000. Effects of diet on pharmacokinetics of phenobarbital in healthy dogs. *Journal of the American Veterinary Medical Association,* Volume 217, pp. 847-852.

Murray, Patil & Fahey, 1997. Raw and rendered animal by-products as ingredients in dog diets. *Journal of Animal Science,* Volume 75, pp. 2497-2505.

Neal, et al., 2008. The ketogenic diet for the treatment of childhood epilepsy: a randomised controlled trial. *The Lancet - Neurology,* 7(6), pp. 500-506.

Paterson, 1995. Food hypersensitivity in 20 dogs with skin and gastrointestinal signs. *Journal of Small Animal Practice,* 36(12), pp. 529-534.

Raubenheimer, e. a., 2015. Nutritional Ecology of Obesity: From Humans to Companion Animals. *British Journal of Nutrition,* Volume 113, pp. 526-539.

Roudebush, Davenport & Remillard, 2010. Flatulence. In: *Small Animal Clinical Nutrition.* Topeka, Kansas: Mark Morris Institute, pp. 1127-1132.

Scarff, D., 2010. An approach to anal sac disease. *Veterinary Nursing Journal,* 25(4), pp. 39-44.

Scott, Greaves & Scott, 1961. Nutrition of the cat. 4. Calcium and iodine deficiency on a meat diet. *British Journal of Nutrition,* Volume 15, pp. 35-51.

Scott, Miller & Griffin, 1995. *Small Animal Dermatology.* 5th ed. Philadelphia: WB Saunders.

Vasconcellos, 2009. Protein intake during weight loss influences the energy required for weight loss and maintenance in cats. *Journal of Nutrition,* 139(5), pp. 855-860.

Washabau RJ, Springfield DR & Buffington CA, e. a., 1986. Evaluation of intestinal carbohydrate malabsorption in the dog by pulmonary hydrogen gas excretion. *American Journal of Veterinary Research,* Volume 47, pp. 1402-1406.