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Published in:
The Veterinary Nurse

Publication date:
2021

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Peer reviewed version

The final published version is available direct from the publisher website at:
[10.12968/vetn.2021.12.3.108](https://doi.org/10.12968/vetn.2021.12.3.108)

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Citation for published version (APA):

Bennett, L. (2021). The legal, ethical and welfare implications of feeding vegan diets to dogs and cats. *The Veterinary Nurse*, 12(3), 108-114. <https://doi.org/10.12968/vetn.2021.12.3.108>

**The Legal, Ethical and Welfare Implications of Feeding Vegan Diets to Dogs
and Cats.**

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The Rise of Veganism

According to The Vegan Society (2020) veganism is defined as;

'A philosophy and way of living which seeks to exclude all forms of exploitation of, and cruelty to, animals for food, clothing or any other purpose.'

There has been an exponential rise in the number of people living a vegan lifestyle; research conducted by the Vegan Society discovered that in 2014, 150,000 (0.25%) of the UK population identified as vegan quadrupling to 600,000 (1.16%) in 2019 (Ipsos MORI, 2016 and 2019). Social media campaigns such as 'Veganuary' and 'Meat Free Mondays' may have influenced the popularity of a meat free lifestyle, in 2020, 402,206 people signed up to Veganuary (Veganuary UK, 2020). Data collected annually from the British Social Attitudes (BSA) surveys have noted an overall decline in the consumption of meat and dairy products since 2012 with 29% of respondents having reduced their overall meat consumption. The most common reasons cited for adopting a meat free lifestyle include; health benefits, taste, value for money, the environmental impact of meat farming and animal welfare (Richardson *et al.*, 1993; Veganuary UK, 2020).

Animal welfare is often cited as one of the main reasons for adopting a meat free diet; Pet owners have been found to have higher empathy towards animals (Paul, 2000, Taylor and Signal, 2005) and those who own pets are more likely to adopt a vegetarian (6.25%) or vegan (5.8%) lifestyle when compared to non-pet owners (Dodd *et al.*, 2019).

For vegan pet owners a moral dilemma occurs between following their own ideology of excluding all animal exploitation versus exploiting production animals and feeding them to their carnivorous pets begging the question 'Are those who follow a vegan lifestyle likely to make their carnivorous pets follow a vegan lifestyle too?'

Trends in pet food often reflects trends in human nutrition; many pet owners anthropomorphise their pets which may explain the increase in demand for commercially produced vegan pet diets as well as serving as a resolution to their moral feeding dilemma. When asked why they chose to feed their pet a meat free diet, owners often cited the same ethical reasons why they adopt a meat free lifestyle themselves (Wakefield *et al.*, 2006).

1. Vegan Diet Composition and Associated Diet Induced Disorders

Physiologically, dogs and (more critically) cats are carnivores throwing into question the nutritional suitability of vegan pet food. Governing bodies such as the Pet Food Manufacturers Association (PFMA), the European Pet Food Federation (FEDIAF) and the Association of American Feed Control Officials (AAFCO) have formulated guidelines detailing the minimum and maximum nutrient levels in commercial pet food to ensure adequate and safe nutrition. The guidelines are peer reviewed by veterinary nutritionists throughout America and Europe and are regularly updated based upon the latest evidence-based medicine. Complete pet food is legally defined as pet food which has sufficient nutrients required for a daily portion (FEDIAF, 2020). Table 2 details the required ingredients for a pet food to be classed as complete.

Zafalon *et al* (2020) conducted a study to evaluate the nutritional composition of all vegan pet foods available on the Brazilian market (n=4) and compare the results with the FEDIAF and AAFCO recommendations. All diets (one for felines, three for canine) met the minimum levels recommended of macronutrients (fat, protein and carbohydrates). However, all foods analysed had one or more micronutrient below recommended minimum levels. Calcium, potassium, sodium, methionine and arginine were all below the recommended levels nor did the Ca:P ratio meet the guidelines recommended levels. No diet contained arachidonic acid: Arachidonic acid deficiency can cause thrombocytopaenia, impairment of platelet aggregation, inability to conceive and congenital birth defects (Pawlosky and Salem, 1996).

Copper concentrations exceeded legal limits in all four diets, two diets contained excess zinc and another diet contained excess iron. Some breeds of dog especially Bedlington Terriers have a genetic sensitivity to copper, copper toxicity is presented with symptoms of abdominal pain, diarrhoea, hyporexia, shock and haemolysis. Supplementation with zinc can reduce copper absorption, however treatment is often unsuccessful and ultimately can be fatal (Blakley, 2020). Given that both zinc and copper levels were in excess it may be that they are countering the action of each other.

Given that it is the most recent study to be conducted, the likelihood of advanced testing techniques can increase the reliability of the results. The main limitations of this study are; the small sample size due to limited numbers of vegan diets available. More significantly, patient assessment and blood concentrations of nutrient bioavailability were not assessed. Although the author recommends patients are not fed these diets due to the nutritional deficiencies it cannot be correlated that any arising illness is directly attributed to diet.

In a 2015 study by Kanakubo and a 2001 study by Kienzle and Englehard both vegetarian and vegan pet food diets were analysed. In Kanakubo's study 25% of diets did not meet the minimum micronutrient requirements set out by the AAFCO. In the two combined studies, 118 diets were analysed finding common deficiencies in protein, calcium, phosphorus, unbalanced Ca:P ratio, sodium, vitamin A, vitamin B12, taurine and arachidonic acid. Formulating a nutritionally balanced vegan diet may not be possible as some nutrients can only be derived from animal origin such as arachidonic acid and taurine. It is well documented cats are unable to synthesize taurine efficiently to conjugate bile acids (Pion *et al.*, 1987) therefore require the addition of it in pet food. Taurine deficiency can lead to feline central retinal degeneration, dilated cardiomyopathy and reproductive failure therefore it is classed

as an essential nutrient (FEDIAF, 2020). Plant-based alternatives are available however these often differ in composition and are required in different amounts to meet nutritional demand and bioavailability (Brown, 2009). Limitations of both studies include single point in time analysis; due to batch discrepancies the results may not be representative of other batches.

Despite being a relatively old paper, Semp (2014) conducted the largest study assessing nutritional content of vegan pet food diets and physically assessing 233 patients including the nutritional bioavailability in their blood. Participants had fed an exclusively vegan diet for six months to seven years with a mean of 2.83 years. Nutritionally, the diets were reported to have deficiencies in protein, fat, carbohydrate, potassium, methionine, cysteine, sodium and cobalamin. Cobalamin is primarily ingested from food derived from animal origin being particularly high in liver, kidney, red meat and dairy. Plants and plant products have virtually no cobalamin and carnivorous animals are unable to produce their own cobalamin. Hypocobalaminemia is associated with nonregenerative anaemia, neutropenia and metabolic brain disorders (Kather, 2019).

Semp reported that there were no clinical abnormalities associated with feeding a vegan diet, however despite 233 participants, only twenty of these patients (8.58%) underwent blood analysis which throws into question the reliability and representability of the sample size on the greater population.

In recent years research has been conducted to investigate poor compliance of accurate labelling and undeclared ingredients in commercial pet food. The objective of Kanakubo's 2017 study was to determine the presence or absence of mammalian DNA in pet food diets marketed as vegan or vegetarian. Kanakubo et al used PCR testing to analyse two samples from a total of fourteen diets three to four months apart with different batch numbers. Seven out of the fourteen diets were found to contain undeclared mammalian DNA with the results being repeatable in six of the diets. These findings confirm the persistent presence of mammalian DNA however, it is not possible to ascertain if this is an intentional addition or due to unintentional batch discrepancies or cross contamination.

Furthermore, nutritional inadequacies and inaccurate labelling should not be limited to commercial plant-based diets; a 2009 study conducted by Hill et al analysed 2208 commercially available pet food diets. It was found that for all nutrients there was a 5% to 30% discrepancy from what was reported on pet food labels to what the diet composition actually contained.

2. Animal Welfare

Animal welfare refers to either the positive or the negative physiological and psychological well-being of animals.

Fraser (2008) proposed three overlapping concepts of animal welfare

1. Physical state and functioning
2. Psychological or mental state
3. Ability to perform natural behaviours and live according to their natural state.

The term animal welfare however, can be interpreted to mean different things to different individuals depending on various factors. Figure 4 shows all the influences that may impact someone's opinion on animal welfare. Multiple influences over companion animal welfare can sometimes result in conflicting ideologies of how animals should be treated, their actual need and the interests involved can lead to ethical dilemmas such as whether to feed a vegan diet.

As veterinary professionals' emphasis is on physical state and functioning, to prevent bias Dawkins (1998) suggests scientific evaluation of animal welfare requires an understanding of behaviour, health and immunology to enable us to objectively determine an animal's physical and psychological state. Ethical judgement is then applied to determine whether the welfare state is acceptable or not.

3. Animal Ethical Theories

The place of animals in human society is central to veterinary ethics with animal welfare being a much-debated topic. Lund *et al.*, (2016) collected data from a questionnaire to identify the animal ethical profile of vegetarians, vegans and meat eaters. Lund found meat eaters predominantly associated with utilitarian theory whereas vegans had the strongest affiliations with animal rights views. Emphasis was on human interest not overruling animal rights as well as the promotion of respectful treatment of animals. Application and development of two of the main classical ethical theories- Utilitarianism and Deontology- provide a background for discussion that can be used to agree or disagree with anthropomorphism of pets.

3a. Utilitarianism

Utilitarianist theory promotes acting in a way which maximises what is best overall and minimises what is worst, the wellbeing of every individual counts including the experiences of non-human animals. Early utilitarian theorists such as Bentham, Mill and Sidgwick all argued that non-human animals should be treated as equals to people. In a practical sense, it is not possible to completely eradicate animal exploitation or animal suffering therefore more current utilitarianists such as Singer and Matheny accept the use of non-human animals as long as they do not suffer. It can be morally justified to eat meat as long as it is not confined, allowed to perform natural behaviours and killed quickly without fear or pain. Veganism in companion animals can be interpreted in support of or against according to utilitarianist theory. By feeding commercial vegan diets you are abstaining from the use of production animals therefore maximising their welfare however this may be at the detriment of companion animal health as demonstrated earlier. It can be argued that it is perfectly acceptable

to feed meat-based pet food as long as the animals have been reared in the most ethically possible way.

3b. Deontology

Deontology quite simply determines right from wrong, early theorist Immanuel Kant argued universal laws are required to govern people's behaviour. His moral laws referred specifically to humans with very little thought regarding animal wellbeing. More recently Regan claims Kant's intrinsic values can include animals; despite them being non human, they still have their own life and their own life experiences. Regan's view is that animal exploitation should be abolished: no animal should be the property of a human. In 2004 he wrote;

'Being kind to animals is not enough. Avoiding cruelty is not enough. Whether we exploit animals to eat, to wear, to entertain us or to learn, the truth of animal rights requires empty cages, not larger cages' (Regan, 2004 p10).

In terms of veganism in companion animals, although deontologists may support a vegan lifestyle, they would not support the ownership of a companion animal.

Even amongst ethical theorists there are disagreements, everyone interprets ethical theories in their own way based upon their own experiences. Although people will never agree, ethical theories can be helpful when deciding how to act. Despite having differing perspectives on a lot of issues, a common theme amongst most ethical theories is that animals should be treated with respect

4. Legal Implications

The Animal Welfare Act (2006) is the principle animal welfare legislation, secondary legislation such as the codes of practice can also be used to promote animal welfare. A person commits an offence if they do not adequately ensure the needs of an animal for who they are responsible are met. The needs of the animal include:

a need for a suitable environment,
a need for a suitable diet,
to be able to exhibit normal behaviour patterns,
to be housed with or apart from other animals, and
a need to be protected from pain, suffering, injury and disease (Animal Welfare Act, 2006).

It could be argued if any diet induced disorders are present due to nutritional inadequacies' from feeding commercial vegan diets, an owner may be liable to prosecution if they fail to treat or prevent them. In reality, it is unlikely an owner would be prosecuted and are more likely to receive advice or assistance from a regulatory body such as the RSPCA.

5. Case Reviews

5.1 Signalment: Case one; an eleven-year-old female neutered Greyhound.

Presentation: The patient initially presented in 2018 to receive radiotherapy for multiple soft tissue sarcomas. The patient was on long term meloxicam and 250mg paracetamol TID due to osteoarthritis. On clinical exam the patient was bright, alert and responsive with an ideal BCS of 4/9. Her clinical exam was unremarkable. Routine haematology and biochemistry were analysed. Haematology revealed a neutropoenia, a very mild anaemia and a mild lymphopenia. Biochemistry revealed a low cholesterol and low lipase

The patient's mild anaemia could be associated with decreased dietary cobalamin, deficiency of phosphorus which leads to a destruction of red blood cells or deficiencies in iron, copper riboflavin, niacin and vitamin (Marks, 2017). The majority of these micronutrients were reportedly below minimum levels in some of the vegan diets analysed. Chronic inflammation and tumours can also cause anaemia both of which the patient suffered with.

5.2 Signalment: Case two is a 14-year-old neutered male cross breed.

Presentation: The patient is under long term care receiving chemotherapy to treat multiple soft tissue sarcomas, Horner's syndrome, a tumour of the parathyroid gland which underwent surgical excision and he has osteoarthritis on the hind limbs and lumbar spine for which he is receiving robenacoxib 80mg SID and paracetamol 500mg TID. On representation the patient was bright, alert and responsive, he was severely obese with a BCS of 8/9. Routine haematology and biochemistry were performed revealing a decreased mean cell volume, lymphopenia, increased urea, lipase, albumin and alkaline phosphatase.

A decreased mean cell volume can be attributed to anaemia and an iron deficiency. None of the studies conducted reported any deficiencies in iron however the recommended dietary iron intake 80mg/kg and deficiencies are seen in vegan or vegetarian diets without adequate supplementation although this is rare (Michel, 2006). Foods high in iron are muscle meat, liver, egg yolks and some dried beans.

5.3 Signalment: Case three is an eleven-year-old neutered male Labrador.

Presentation: The patient has a pulmonary mass, osteo arthritis, intravertebral disk extrusion and a history of chronic diarrhoea. The patient represented due to sudden onset of pyrexia and lethargy. On presentation the patient was quiet, alert and responsive, he was pyrexemic with a rectal temperature of 40.7, BCS was 7/9. He was tachypnoeic and tachycardic with a mean arterial blood pressure of 60mmHG. Routine haematology and biochemistry were run which revealed a raised alanine aminotransferase, alkaline phosphatase, gamma glutamyl transferase and low magnesium. Hypomagnesemia is frequently found in critically ill animals and is often associated with a guarded prognosis. There are various causes one of which is dietary insufficiency, if found to be related to diet, treatment is often simple and requires supplementation or changing to a diet with increased calcium levels (Dhupa, 1998).

6. Discussion

As part of the case studies, no owner interview was conducted, this would have been beneficial to gain greater insight into why they chose to feed their pet a vegan diet and how long they had been feeding a vegan diet for and what effects they believe it had on their pets.

Both case one and case two were under long term care for staging and treatment of cancerous tumours. Companion animal oncology is one the most rapidly progressing fields of veterinary medicine and provokes a lot of debate amongst veterinary professionals and clients. It takes a very dedicated owner to embark upon a chemotherapy and or radiotherapy schedule; they are often ruled by an intense treatment schedule, require a lot of medication and are not given without their own risks of side effects. It is understandable then that these owners would research alternative therapies to use concurrently to cancer treatment.

Patient one's owners were reportedly feeding V-Dog after researching their claims that it is a natural anti-inflammatory which reduces joint pain and improves mobility as well as having the ability to 'supress cancer growth and kill cancer cells' (V-Dog 2021). V-Dogs claims are reportedly taken from research conducted in human medicine however these claims are yet to be researched in companion animals therefore no assumptions can be made as to its anti-inflammatory or cancer fighting properties.

Patient two's owner was following the 'Joanna Budwig' diet which claims to treat arthritis, cancer, cardiovascular disease, diabetes and liver disease (Skelton, 2016). The diet is primarily designed for humans and is based upon feeding high levels of flaxseed, cottage cheese, milk, fruit and vegetables. It has been adapted to feed companion animals permitting some high quality, organic meat and fish to be added into the diet.

Research in human medicine has found that omega 3 fatty acids and flax sees reduce some chemicals associated with cancer (Freitas and Campos, 2019). Cancer research UK have released a statement stating that a lot of these claims are still undergoing extensive research and specifically that the Budwig diet is lacking in many nutrients and that despite Budwigs claims, there have been no clinical trials to support them (Cancer Research UK, 2018).

Patient 3 was primarily fed a vegetarian commercial dog food diet (unknown brand) with the owner adding fresh vegetables and rice. The owner reported that the patient was 'allergic' to most meat-based diets which resulted in chronic diarrhoea therefore had eliminated them from his diet although this has never been investigated. Dietary intolerances are characterised by generalised pruritis, digestive upset and chronic skin conditions (Hills Pet Nutrition, 2020). Dietary elimination trials are frequently performed with dietary intolerances however rather than eradicating protein from the diet it is advised that it is swapped for a diet with a novel protein or a commercial diet specifically designed to reduce the symptoms associated allowing for complete nutrition.

As part of this review, The Vegan Society were approached to ask for scientific peer reviewed evidence to support feeding companion animals on a meat free diet. In their response, they were unable to direct me to any literature apart from blog posts and testimonials on their website. The Vegan Society did however state that they recommend owners do what is best for their pets and seek advice from a veterinary professional before changing onto a vegan diet.

The positive impact of adequate nutritional is well established in veterinary medicine, incorporation of regular nutritional assessments allows for maintenance of patient health and their response to disease. Client communication and compliance are essential for maintaining targets and expectations. Veterinary nurses play a major role and many practices offer free nutrition clinics which should be utilised. The WSAVA have formulated a two-part nutritional assessment shown in figure 6 below which vets and veterinary nurses are able to conduct as part of regular patient monitoring.

Full medical history, body condition score and muscle condition score formulate the basic nutritional screen, any abnormalities identified should prompt further investigation into the patient and their diet and formulation of a treatment plan.

The 2014 study conducted by Semp is the most comprehensive studies for assessing the effects of vegan diets on companion animals as it assessed nutritional content of the diets and conducted health assessments of patients fed the diets despite being in a very limited manor. It can be adapted to provide more representative results by ideally conducting multiple nutritional dietary analysis over different time frames and to include different batches. Running concurrently to the dietary analysis, patient should be screened at regular intervals following the WSAVA assessment guidelines. Routine haematology and biochemistry should also be conducted to assess for nutrient bioavailability. Any alterations in diet or dietary supplementation should be recorded and followed up with assessment to determine progression or improvement.

All three case studies presented to a referral hospital for investigation of medical conditions for which they were already symptomatic often with multiple comorbidities. The cause abnormalities on the blood work cannot be differentiated from their disorders, treatment they were receiving, or diet therefore cannot say if diet was causal or effect. Conducting a study using only healthy, asymptomatic participants fed vegan diets would allow for more association with blood abnormalities and diet.

7. Conclusion

Companion animals fed improper diets may develop health and welfare problems, inappropriate diets can result in nutritional imbalance or malnutrition. Feeding vegan diets to companion animals should be approached with caution; much of the research conducted has found that despite correct labelling, commercial vegan diets do not meet the legal nutritional guidelines putting pets at risk of diet induced disorders.

The reason for feeding inappropriate diet may be related to the owner's lifestyle, their own diet, anthropomorphising animals and their own personal or religious beliefs. Vegan owners in particular are morally and ethically conflicted with their decision making due to their own personal beliefs. Additionally, societal norms, socioeconomics, inaccurate or unscientific information from various sources can

mislead or misinform well-meaning pet owners. Owners should be aware that any nutritional inadequacies and diet induced disorders are likely to negatively impact a patient's welfare and could in theory make owners liable to prosecution if they are unwilling to follow expert veterinary advice.

Further research is required to understand the long-term effects on carnivorous patients, until then veterinarians must utilise the information that is available ensuring a proactive approach to prevent, treat and educate owners regarding any diet induced disorders to ensure the best patient welfare.

8. Key Points

Veganism is on the rise both in humans and in companion animals with many owners citing animal welfare being their primary reason for adopting a vegan lifestyle.

Feeding companion animals vegan diets is subject to legal, ethical and welfare implications. Feeding a vegan diet to dogs and cats significantly impacts their welfare as it puts them at undue risk of developing diet induced disorders leaving owners liable to prosecution if they are unwilling to adhere to expert recommendations.

As commercial vegan diets are a relatively new phenomena, more research needs to be conducted to understand the nutritional impact including the long- and short-term effects. In the meantime, veterinary professionals should continue to educate owners on suitable diets based on the individual's requirements.

Conflict of Interest

There is no conflict of interest

References

Animal Welfare Act (2006) Gov.UK available at <https://www.legislation.gov.uk/ukpga/2006/45/section/9> last accessed 18.1.2021

Blakley (2020) Copper Poisoning. *MSD Veterinary Manual Online*. Last accessed 15.1.2021

Brown, (2009) Nutritional and Ethical Issues Regarding Vegetarianism in the Domestic Dog. *Animal Science* online https://www.une.edu.au/__data/assets/pdf_file/0015/30471/brown-raan-2009-vegetarian-dog.pdf last accessed 22.12.2020

Cancer Research UK (2018) Budwig Diet. Available online <https://www.cancerresearchuk.org/about-cancer/cancer-in-general/treatment/complementary-alternative-therapies/individual-therapies/budwig-diet> last accessed 17.1.2021

Dodd S, Cave N, Adolphe J, Shoveller A, Verbrugghe A. Plant-based (Vegan) Diets for Pets: A survey of Pet Owner Attitudes and Feeding Practices. *PLoS One* published online

Dhupa and Proulx (1998) Hypocalcaemia and Hypomagnesemia. *Journal of Veterinary Clinics North America: Small Animal Practice*. Issue 28 p587-608

FEDIAF The European Pet Food Industry (2020) *Nutritional Guidelines for Complete and Complementary Pet Food for Cats and Dogs*. Online last accessed 5.1.2021

Food Standards Agency. (2014). *Food and You Survey, 2014*. [data collection]. UK Data Service. published online <https://www.food.gov.uk/sites/default/files/media/document/food-and-you-2014-uk-bulletin-4.pdf> last accessed 11.12.2020

Freitas and Campos (2019) Protective Effects of Omega-3 Fatty Acids in Cancer Related Complications. *Nutrients*. Issue 11 p945

Fuller, E., et al. (2019). Food and You Wave 5: Combined report. [Online] Available at: <https://www.food.gov.uk/sites/default/files/media/document/food-and-you-wave5-combined-report-web-revised.pdf> last accessed 11.12.2020

Hill, Choate, Scott and Molenberghs (2009) Comparison of the Guaranteed Analysis with the Measured Nutrient Composition of Commercial Pet Foods. *Journal of the American Veterinary Medical Association*. Volume 234 p347-351

Hills Pet Nutrition (2020) How Food Allergies Can Affect Your Dog. Available online <https://www.hillspet.co.uk/dog-care/healthcare/food-allergies-in-dogs> last accessed 20.1.2021

IDEXX Laboratories (2007) *Understanding Your Pet's Diagnostic Testing*. IDEXX, Maine

Ipsos Mori, (2016) and (2019) Poll Conducted for the Vegan Society, Incidences of Vegans Research. published online <https://www.ipsos.com/sites/default/files/migrations/en-uk/files/Assets/Docs/Polls/vegan-society-poll-2016-topline.pdf> last accessed 12.12.2020

Kanakubo, Fascettie and Larsen (2015) Assessment of protein and Ammino Acid Concentrations and Labeling Adequacy of Vegetarian Diets Formulated for Dogs and Cats. *Journal of American Veterinary Medicine*. Issue 247 p385-392

Kanakubo, Fascetti and Larsen (2017) Determination of Deoxyribonucleic Acid (DNA) in Commercial Vegetarian and Vegan Diets for Dogs and Cats. *Journal or Animal Physiology and Animal Nutrition*. Volume 101 p70-74

Kather, Grutzner, Kook, Dengler and Heilmann (2019) Review of Cobalamin Status and Disorders of Cobalamin Metabolism in Dogs. *Journal of Veterinary Internal Medicine*.

Kienzle and Engelhard (2001) A Field Study on the Nutrition of Vegetarian Dogs and Cats in Europe. *Compendium on Continuing Education for the Practicing Veterinarian*. Issue 2, p. 81

Lee and Simpson (2016) Are we Eating Less Meat? A British Social Attitudes Report. Nat Cen Social Research Published online <https://natcen.ac.uk/our-research/research/british-social-attitudes-are-we-eating-less-meat/> last accessed 12.12.2020

Lund, McKeegan, Cribbbin and Sandoe (2016) Animal Ethics Profiling of Vegetarians, Vegans and Meat-Eaters. *Anthrozoos*. Issue 29 p86-106

Marks (2017) Anaemia in Dogs. *MSD Veterinary Manuel* online <https://www.msdrvetermanual.com/dog-owners/blood-disorders-of-dogs/anemia-in-dogs>

Michel (2006) Unconventional Diets for Dogs and Cats. *Vet Clinical North American School of Small Animal Practice*. Issue 36 p1269-1281

Paul, E (2000) Empathy with Animals and Humans: Are They Linked? *Anthrozoos A Multidisciplinary Journal of the Interactions of People and Animals*. 13, 194-202

Pawlosky and Salem (1996) Is Dietary Arachadonic Acid Necessary for Feline Reproduction. *The Journal of Nutrition* Issue 126 p1081-1084

Pion and Rogers (1987) Myocardial Failure in Cats Associated with Low Plasma Taurine: A Reversible Cardiomyopathy. *Science* Issue 237 p764-768

Regan (2004) *Empty Cages: Facing the Challenge of Animal Rights*. Rowman and Littlefield. Maryland p10

Richardson, N et al., (1993) Current Attitudes and Future Influences on Meat Consumption in the UK. *Appetite* 21, 41-51

Semp (2014) *Master's Thesis. Vegan Nutrition of Dogs and Cats*. Veterinary University of Vienna; Vienna, Austria

Skelton (2016) Budwig Diet for Dogs. Available online <https://www.budwig-diet.co.uk/dogs/>

Taylor and Signal (2005) Empathy and Attitudes to Animals. *Anthrozoos A Multidisciplinary Journal of the Interactions of People and Animals*. 18, 18-27

Veganuary UK (2020) Veganuary 2020 Official Survey Results. published online <https://veganuary.com/wp-content/uploads/2020/03/Survey-results-2020-abridged.pdf>

V-Dog (2021) Can Consuming Animal Protein Increase Your Cancer Risk? https://v-dog.com/blogs/v-dog-blog/can-consuming-animal-protein-increase-your-cancer-risk?_pos=2&_sid=3c74bf820&_ss=r

White, R. and Frank, E. (1994). Health effects and prevalence of vegetarianism. *Western Journal of Medicine* 160, 465–470.

Wakefield, L, Shofer, F, and Michel, K (2006). Evaluation of Cats Fed Vegetarian Diets and Attitudes of Their Caregivers. *Journal of the American Veterinary Medical Association* 229, 70–73.

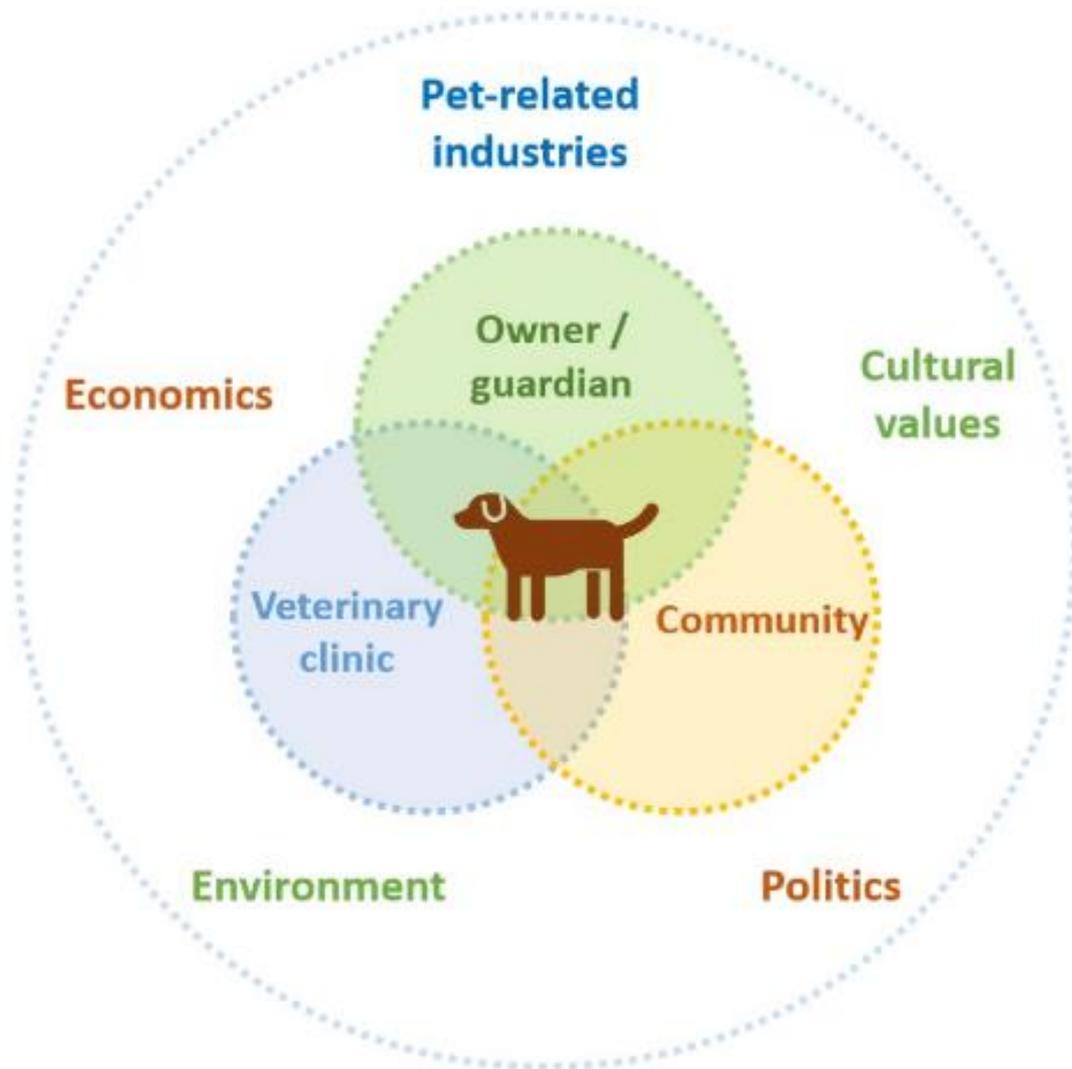
Zafalon, Risolial, Vendramini, Ayres-Ridrigues, Pedrinelli, Teixeira (2020) Nutritional Inadequacies in Commercial Vegan Foods for Dogs and Cats. *Plos One* Vol 15 Issue 1 p1-17

Table 2.1: Required Nutrients for a Nutritionally Complete Pet Food Diet

Major Nutrients	Fatty Acids	Amino Acids	Minerals	Vitamins	Vitamin-like Substances
Protein	Linoleic acid	Arginine	Calcium	Vitamin A	Taurine (cats)
Fat	Alpha-linolenic acid	Cystine	Sodium	Vitamin D	Choline
	Arachidonic acid (cats)	Histidine	Chloride	Vitamin E	
	Eicosapentaenoic acid (EPA)	Isoleucine	Manganese	Vitamin (Thiamine)	B1
	Docosahexaenoic acid (DHA)	Phenylalanine	Phosphorus	Vitamin B2 (Riboflavin)	
		Tyrosine	Copper	Vitamin (Pantothenic acid)	B5
		Threonine	Magnesium	Vitamin (Niacin)	B3
		Lysine	Zinc	Vitamin (Pyridoxine)	B6
		Tryptophan	Potassium	Vitamin (Biotin)	B7
		Leucine	Iron	Vitamin (Cyanocobalamin)	B12
		Methionine	Iodine	Vitamin B9 (Folic acid)	
		Valine	Selenium	Vitamin K	

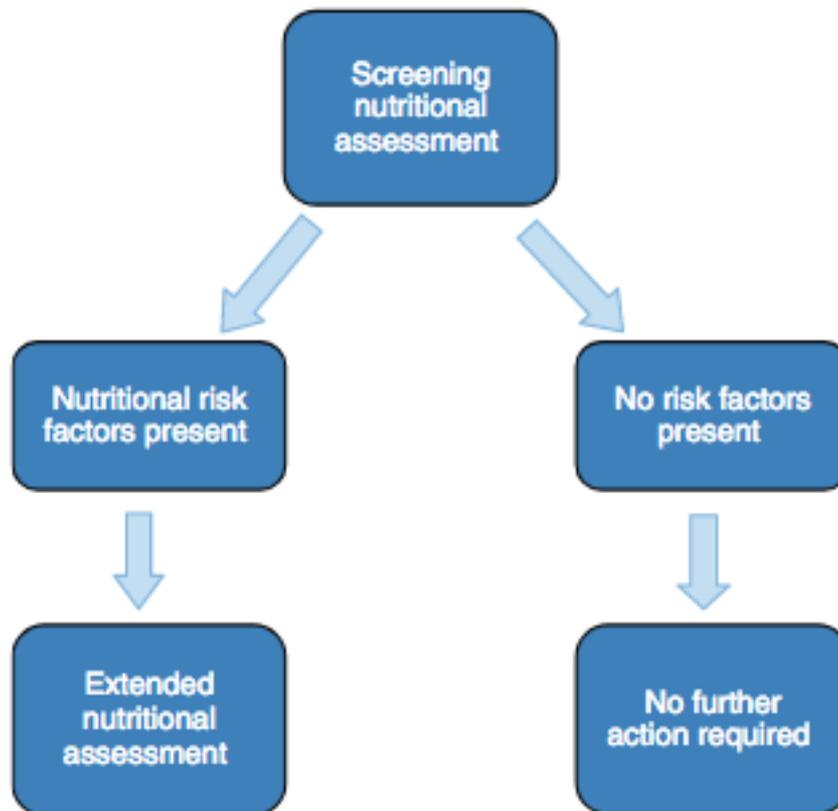
(Source: Adapted from FEDIAF Guidelines, 2020)

Figure 4.1 Influences Over pet Ownership



(Source: WSAVA Welfare Guidelines 2019)

Figure 6.2 Two Part Nutritional Assessment Flow Chart



Source: WSAVA, 2011