

COMMERCIAL AND NATURAL DOG AND CAT FOOD: STUDYING THE BENEFITS AND INCONVENIENCES OF USING CURRENT TYPES OF FEED - A REVIEW

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Abstract

The essential aspects in choosing pet food are the quality and nutrient content of the food. This becomes difficult for pet owners to manage when many diets or types of dogs and cat food are available on the market as will be mentioned in the study: commercial pet food, BARF (Biologically Appropriate Raw Food), home-made or vegetarian diets. There are also many brands and recipes in the commercial pet food industry, which again causes confusion and misleads pet owners. Pet owners now treat their dogs and cats as family members, which is why studies show that globally owners have become more aware of their pets' needs. The current study attempts to present the benefits and drawbacks/disadvantages of different varieties of dog and cat food. By providing an overview of pet feeding patterns, the study seeks to clarify the nutritional needs and highlight the physiological digestive capabilities of two specialized carnivores: the dog and the cat.

Key words: BARF, carnivores, cat, dog, home-made, pet food.

INTRODUCTION

The food offered to pets, dogs and cats, can be found in the following forms: commercial pet-food (dry, semi-moist, moist), homemade by the owner from natural ingredients/foods, raw food such as the BARF diet (Biologically Appropriate Raw Food), vegetarian food, and mixed food which is composed of two or more of the food variants already presented.

The preparation of commercial dog food dates back to 1861, and its founder is James Spratt who introduced a product in the form of "biscuits" for dogs to the American market (Fraser-Miller S. et al., 2021)

Commercial dog food is designed specifically for dogs and cats and is now manufactured in a variety of forms: dry or kibble, canned moist food and semi-moist food. Nutrition research centers have also created specialized feeds called "prescription diets" designed to support or enhance the biological functions of the animal's body (FDA, 2016).

Vegetarian dog and cat food can be found either as dry or wet commercial food or as cooked food, prepared by the owner from cooked or raw vegetables, fruit or cereals.

The trend for owners to offer a vegetarian-type food to their pets is ongoing and growing in recent years. Studies estimate a global vegetarian food market value of \$ 8.7 billion in 2020 and a future increase in this value (The Insight Partners, 2021).

MATERIALS AND METHODS

The current study, a review, was focused on presenting and discussing the types of dog and cat food currently available on the market and the benefits and drawbacks of their use in the daily diet of pets. The search strategy for the information on types of pet food on the international market was by keywords such as "commercial dog/cat food", "BARF food", "diet", and "vegetarian dog/cat food". In the search for statistical data on the number of dogs and cats worldwide, studies and research conducted between the years 2013-2014, and 2020 for cats, were consulted. Also an annual report conducted in 2021 was used to estimate dog and cat populations from Europe, using the official website of FEDIAF (The European Pet Food Industry).

For the definition of terms such as "prescribed diet" the official FDA website was consulted, and for the provision of current statistics and future trends in the purchase of vegetarian pet food the Insight Partners data platform was accessed.

The data summarised in Table 1 on the benefits and disadvantages of each type of pet food for dogs and cats were selected from studies in the scientific literature and nutrition books for dogs and cats, research conducted between 1994 and 2023. Also for raw feeding and mainly for "Biologically appropriate raw feeding", the BARF guidelines of 2001 were consulted, as well as studies and questionnaires carried out in 2013 and 2017 on feeding practices used by owners for their pets.

RESULTS AND DISCUSSIONS

Globally the population of both owned and unowned dogs is estimated to be between 700 and 1 billion (Hughes et al., 2013, Gompper, 2014) according to data provided by several organizations. Recent studies also estimate (but cannot provide an official number) a population of 600,000,000 free-roaming and owner-owned cats (Kays, 2020).

The European Pet Food Industry provides more concrete information and data on the number of pets in Europe and, subsequently in the European Union, that are in the care of an owner as well as an approximate number that are either in shelters or on the streets.

According to FEDIAF's annual reports, most recently in 2021, there are approximately 92.9 million dogs and 113.5 million cats, with 24% of households in Europe owning at least one dog and 26% owning at least one cat, with the remaining households having an exotic pet such as cage birds, fish, rabbits, turtles or other animals.

With the increase in the number of pets and especially in dog and cat populations, the requirements of these animals and their owners have also become increasingly obvious and even challenging for the commercial pet food industry.

Originally the dog and cat are considered two specialized carnivores, being ancestors of the wolf in the case of the dog or the wild cat - *Felis*

sylvestris lybica from North Africa in the case of the domestic cat (Serpell A., 2014).

Some researchers consider the cat an even more specialized predator than the wolf in the study. The domestication and history of the cat, researchers classify cats as obligate or strict carnivorous species, although they have the ability to digest some carbohydrates as well (Serpell, 2014).

Carnivores naturally evolved based on the nutrient content of their prey, for example, pre-formed vitamin A (which is synthesized in the prey animal from carotenoids). Elevated ammonia levels generated by the proteolysis phenomenon in carnivores increase urea cycle activity and hence the requirement for arginine (Hynd, 2019).

Taurine is a sulphur-containing amino acid synthesized in noncarnivores from L-cysteine, but taurine cannot be formed in carnivores because they lack the enzyme cysteine sulphate decarboxylase, therefore in cat food guidelines this amino acid is integrated and considered essential (Hynd, 2019). Cats also require high levels of dietary niacin because they have limited ability to convert the essential amino acid tryptophan to niacin (Hynd, 2019).

A study that investigated the level of taurine inclusion in pet food, and how this level is altered by subjecting the food to a thermal process, states that the level of taurine in plants cannot be quantified but significant amounts of this sulfonated amino acid have been found in most animal tissues and especially in muscle (Spitze, 2003).

More recent studies also confirm that taurine, the omega-3 fatty acids EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid) as well as vitamin A are predominantly, if not exclusively, found in animal tissues (Dawczynski, 2007).

Current studies discuss not only the need for taurine in cats but also in some breeds of dogs, breeds prone to heart disease, and the lack of this amino acid in food can create serious problems such as dilated cardiomyopathy, according to a study of 24 Golden Retriever dogs. Twenty-three of these dogs were fed commercial diets such as dried food rich in legumes and grain-free commercial dried food, which did not pass the quality tests required by AAFCO.

Therefore following blood tests, taurine levels found in the blood, echocardiography, and nutritional history verified, it was concluded that 23 of the 24 dogs tested suffered from dilated cardiomyopathy secondary to a taurine deficiency in the diet and that dietary taurine supplementation resulted in improved health in the dogs studied (Kaplan et al., 2018).

Furthermore, the literature suggests a genetically transmitted taurine deficiency, which occurs as a predisposition only in certain breeds such as Rottweiler (Petric & Tomsic 2008), Great Dane, Doberman pinscher or other breeds (Stern et al., 2018).

Taking into account the previous discussions and information, in the following, the types of food and their advantages and disadvantages, mentioned by the literature and nutrition research institutes, have been presented.

Commercial pet food for dogs and cats (the most numerous pets in the population) has been designed to facilitate or ease the feeding of animals in order to provide a complete and balanced diet for the pets.

This is why the commercial feed is considered "satisfactory" from a nutritional point of view once it meets certain standards such as complete, balanced, palatable, easily digestible, and safe, and passes the quality tests of the nutritional research organizations - NRC, AAFCO, FEDIAF, but is also optimized in relation to the specific nutritional needs - species, breed, age, physiological state (endogenous factors related to the animal).

Achieving adequate nutritional health involves more than just meeting the nutrient profiles, additional factors need to be considered. An iterative process, in which each factor affecting the animal's nutritional status is assessed and reassessed as often as necessary (Thatcher, 2010), results in a comprehensive nutritional assessment of the patient.

The factors to be evaluated include the animal, diet, feeding management, and environmental factors. Factors specific to the animal include age, physiological condition, the physical

activity the animal is subjected to (Thatcher, 2010) but also ailments that occur during the lifetime of the animal.

Pet food is available in three basic forms: dry, semi-wet, and wet. As the names of the categories suggest, the water content differs significantly between the three forms.

Dry dog and cat food according to FEDIAF, has a moisture content of less than 14% and is composed of carbohydrates such as polysaccharides, oligosaccharides, monosaccharides, and fiber; proteins such as animal and vegetable proteins; amino acids; lipids such as vegetable oils and animal fats; vitamins; minerals; and preservatives (Crane S., 2010). Processed dry foods have been produced with a caloric density of 2.7 to 7.1 kcal ME/g food (Hand M., 2010).

According to official sources, semi-moist pet food has a moisture content of between 14% and 60%, and wet food has a moisture content of at least 60%. Studies draw attention to the increased palatability of semi-wet or wet foods such as cans and pouches which can cause dogs to consume this type of food more quickly (Arraujo, 2004).

Dry feed is produced by the extrusion process (Else, 1997), a process that uses high steam pressure and heat by passing ingredient mixtures through a mould (a machine equipped with a spiral) (Pop, 2006), resulting in compound feeds for pets.

The types of commercial pet food are appreciated by owners both economically and in terms of packaging because they are easy to store and have a long shelf life, these are just some of the advantages found about this type of food, the others have been presented in Table 1. Figure 1 illustrates the types of food most commonly available on the market and most commonly used by dog and cat owners. In the figure shown, connections have also been made between certain types of food such as home-cooked food and raw food and vegetarian food which can be seen as both commercial food and home-cooked food:

Table 1. Benefits and drawbacks of the types of food currently used in dog and cat nutrition

Dry/semi-wet/wet food	Home-made food	Raw food	Vegetarian food
<p>Benefits</p> <ul style="list-style-type: none"> - according to the manufacturer the food contains all the nutrients the dog or cat needs^{(1), (2)}; - the food is conveniently packaged and easy to store and has a long shelf life^{(1), (2)}; - are convenient types of food for owners being the easiest way to feed their companion⁽¹⁾; - feed formulas are available for different life stages, breeds, or medical conditions⁽¹⁾; - feeding guidelines for the weight of dogs or cats also appear on packaging. <p>Drawbacks</p> <ul style="list-style-type: none"> - most products are multifunctional (formulated for all breeds, sometimes for all ages)⁽²⁾; - products sold in bulk, without package and specifications may have nutrients above the maintenance level of a sedentary dog or cat and may have a relatively low level of nutrients for the dog used to intense activities⁽²⁾; - labels and ingredients in pet food cause confusion among owners⁽³⁾. 	<p>Benefits</p> <ul style="list-style-type: none"> - feeding the animal a natural diet cooked from food chosen by the owner⁽³⁾; - a diversified diet⁽³⁾; - no additives, preservatives or palatants are added⁽³⁾; - the desire of dog and cat owners to improve the relationship between them and their pets⁽¹³⁾. <p>Drawbacks</p> <ul style="list-style-type: none"> - 17% of pet owners mention the internet as their main source of food recipes⁽⁴⁾; - some diets are not balanced and not nutritionally adequate to support adult maintenance⁽³⁾ - calcium/phosphorus ratio and vitamins A and E were below current recommendations⁽⁵⁾. 	<p>Benefits</p> <ul style="list-style-type: none"> - digestive enzymes in fresh foods increase biological availability⁽⁶⁾ - a positive effect on the immune response⁽⁷⁾ - reduction of dental plaque deposition⁽⁷⁾ - increased physical activity and better general condition of the animal⁽⁷⁾ <p>Drawbacks</p> <ul style="list-style-type: none"> - a high risk of microbial contamination in both commercial and home-prepared BARF diets; - public health risk⁽⁸⁾; - environmental contamination is also possible as a result of the excretion of pathogenic microorganisms⁽⁹⁾. 	<p>Benefits</p> <ul style="list-style-type: none"> - a low risk of cardiovascular disease⁽¹⁰⁾ - improved skin and coat appearance⁽¹¹⁾; - reduction of signs of arthritis⁽¹¹⁾; - a low risk of obesity⁽¹¹⁾; <p>Drawbacks</p> <ul style="list-style-type: none"> - vitamin B12 deficiency⁽¹⁰⁾; - lower levels of iron⁽¹⁰⁾; - significantly lower folic acid⁽¹⁰⁾; - urine alkalization⁽¹²⁾. - changes in blood biochemical parameters that may indicate muscle destruction that was associated with cardiomyopathy in cats⁽¹⁴⁾.

Sources: ⁽¹⁾FEDIAF, 2021; ⁽²⁾Girginov D., 2007; ⁽³⁾Schenck P., 2010; ⁽⁴⁾Laflamme D., 2008; ⁽⁵⁾Diquelou A., 2005; ⁽⁶⁾Prochaska L.J., 1994; ⁽⁷⁾Morgan et al., 2017; ⁽⁸⁾Lejeune J., 2001; ⁽⁹⁾Finley R., 2006; ⁽¹⁰⁾Schlesinger D., 2011; ⁽¹¹⁾Peden J., 1999; ⁽¹²⁾Knighr A. et al., 2016; ⁽¹³⁾Pedrinelli V. et al., 2017; ⁽¹⁴⁾Dominguez-Oliva et al., 2023.

- home-cooked food can, depending on the wishes of the dog or cat owner, be prepared in such a way that the ingredients added to the food are either thermally prepared or not.;
- raw food, which is not thermally prepared, can be prepared from ingredients or sources of animal origin such as raw meat, raw bones, raw eggs; or vegetarian and contain only sources of plant origin such as vegetables, fruit, etc.

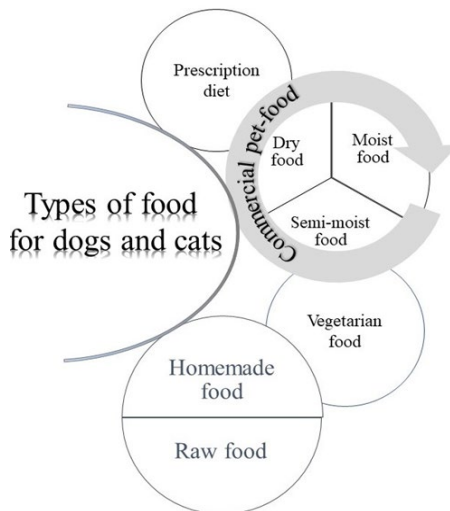


Figure 1. Types of food for dogs and cats

The BARF diet, originally called 'bones and raw food' and later 'Biologically appropriate raw food' created by Australian veterinarian Ian Billinghurst in the 1990s, is also integrated into the raw food diet as a 'natural' alternative to commercially processed food.

The creator of the BARF diet, Billinghurst considered dogs - like cats - obligate carnivores, so he stated that adding carbohydrate sources to a dog's food is unhealthy and therefore not recommended.

In recent years, the tendency to feed dogs and cats a BARF (biologically appropriate raw food) diet has become increasingly popular. It was estimated that the number of pet owners feeding their dogs all or part of a raw diet meets in some European countries is up to 51% (Corbee, 2013). Among the disadvantages of the consumption and use of raw food, researchers also point out the risk for public health, due to the use of the BARF diet, for owners and other household members who are exposed daily to the

transmission of pathogenic microorganisms from raw meat (Lejeune, 2001).

Environmental contamination is also possible as a result of the excretion of pathogenic organisms from the definitive host, the dog or cat, which may be asymptomatic carriers (Finley, 2006).

Home-cooked food should be prepared according to the recipe given by the nutritionist, veterinarian or found in books, without substituting, adding, or omitting an ingredient as each ingredient in the diet is essential, providing the level of specific nutrients needed, therefore correct preparation of home-cooked diets requires time and effort.

Home-made diets, according to specialists, do not contain preservatives and have a high moisture content, thus they become susceptible to fungal and bacterial contamination if left at room temperature for more than a few hours and not stored as directed at refrigeration temperatures (Schenck, 2010).

Similar to the practice of vegetarianism in humans, the vegetarian diet for pets involves the exclusion of animal protein sources or any animal products or by-products from the diet of dogs and cats (Matthew, 2012).

This shift in dogs' diets towards a vegetarian diet sometimes comes in response to the inability to feed the dog animal protein due to the onset of atopic dermatitis, say some pet owners, an increasingly common skin disease in some breeds of dogs like Labrador Retrievers, German Shepherds, Pit bulls, Pugs, Boxers, Shih tzus and others (Miller, 2013).

Some researchers believe that a diet based on raw fruits and vegetables lowers the risk of heart disease based on improved LDL cholesterol and triglyceride concentrations, but note that there is a possible increased risk of coronary heart disease due to cyanocobalamin (vitamin B12) deficiency (associated with increased plasma homocysteine and lower concentrations of HDL - lipoprotein synthesized and secreted in the liver) (Schlesinger, 2011).

A current study conducted in 2023 states that in cats fed a vegetarian diet changes in blood biochemical parameters were observed, specifically creatine kinase activity was increased and may indicate muscle destruction that was associated with cardiomyopathy, but

the study does not indicate the same changes in dogs (Dominguez-Oliva et al., 2023).

The humanization of the pet has also had an impact on the diversity of food types, as could be observed throughout the study, with the culinary tendencies adopted by humans often being imposed or tried on dogs and cats.

CONCLUSIONS

Choosing the right type of food or diet for a pet dog or cat has become an elusive goal with so much on offer.

This study attempts to present and explain the types of food available on the market and to provide information from scientific research, suggesting that the correct diet for dogs and cats would be one that provides nutrient sources that meet the specific nutritional needs of carnivores, the descendants of wolves and wild cats, the obligate carnivores.

ACKNOWLEDGEMENTS

The current study is part of a PhD thesis that focuses on the study of nutritional diseases in companion animals - dogs and cats.

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