Dog Food: Choosing the Right Food for Your Dog

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Abstract

As we live with our pets, the emotional and physical wellness are made by companion animal and Health of community together with benefits that pets bring to us. Most commercial brands based on insights developed does not look like have undertaken research or reliably based on published findings that home cooking is superior. Therefore, a broad knowledge about the essentials and steps in the manufacturing of pet food material especially the dog food. It is very important to check what dog food it is and how much nutrition does it contain. The current health and nutrition system of society at large should be able to deliver the needs of ever increasing population of companion animals. We know that nutritionally complete pet feed can impact the GIT. The physiology could be modified for good changes in biochemical markers, enhance immune response and if reduces/depleted, the risk of having a heart disease or weight loose are there. Therefore, it is crucial to have a sound knowledge of dog food in terms of calories, necessary constituents and those which need to be used added with caution.

Keywords: Dog food, Fresh pet food, Effects on Health of Pet, Obesity, Heart Diseases

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Introduction

Companion animals are very important in our life. They provide a very positive impact on both emotional and physical health of a person to whom they are attached (Gautam et al., 2018). These animals help in strengthening the community in which we live. Physical benefits which our pets will get are increased activity, decreased blood pressure, low chances of obesity and heart diseases also it can help in reduction of allergic reactions that occurs due to asthma in puppies (Paluch et al., 2022) Pet ownership has close relationship with more social interactions and cohesion. To formulate food based on excess then minimum recommended amounts results in food wastage, or pets over consume the food that results in obesity (Ekelund et al., 2015; Ekelund et al., 2019). There are different types of recommendations about what kind of food is best for dogs. However most of the foods which are available on commercial levels are formulated by using scientific studies on nutrition (Freeman et al., 2006), but there aren't any reliable prior studies that recommend domestically prepared food is the superior option. Generally pet food is of two types: either dry (kibble) food or wet (canned) food (Gautam et al., 2018). One should keep in mind that these foods must meet the nutritional requirements of the pet animals. So what is the best dog food for Dogs? This depends on your dog's needs. Dry dog food, wet homemade food and all of the semi-moist is very important to look over the ingredients of your pick in order for it to be the right product that caters specifically with the needs of your dog (Alvarenga et al., 2018).

However, if you are willing to put in some research and work, your dog will live a healthy life. Various types of pet foods are listed in table 1.

Ingredients Selection

In case of humans we have to select just between animal and plant based diet but in case of animals we have a variety of feeds to select so we should be more cautious about their diet because it has direct effect on animal's health. Here are some ingredients which we can use for better animal diet (Tobie et al., 2015).

Proteins

For choosing feed ingredients for our pet we must consider their quality and meat percentage in them (Laflamme et al., 2008). Our pets have different nutrient requirements (e.g. protein, arginine, taurine, vitamin A, vitamin D, niacin) and these can be fulfilled by many ingredient sources. On moderate basis it is assumed that animal based proteins gives ~11 times greater output then grain based proteins .For this analysis they (Hu, 2020) used corn as grain source and consider that animal based proteins have 1.4 times greater biological value then grain based proteins. Hu (2020) done the same procedure to estimate water requirements and they estimate that water requirements

for 1kg animal proteins are 100 times more than grain based proteins. The grain source used was soybean and recent studies shows that soybean is 4.4, 26 times better in water requirements (Reijnders & Soret, 2003) and it uses land more efficiently as more as 6-17 times. Per feed may contain considerable amount of fish proteins. But the drawback is that fishes caught by trawling and crop production is using an estimated amount of ~14 times more fossil fuels as compared to vegetable proteins (Sahana et al., 2023) and this costs may increase if we do processing of feed (Brown et al., 2009; Coppola et al., 2021). The grain based proteins have low digestibility as compared to animal based proteins. For example soy based and cereal based proteins have digestibility ranges between 71-80% whereas meats are digestible to the level of 80-90 % (Aldrich et al., 2015).

Table 1: Types of Pet food (Gautam et al., 2018)

Types	Description	Examples
Pet raw food	• Pet food that has not undergone any heat or preservation treatment (refer to definition) • Prepared with or without added ingredients	• Raw meat mince or chunks • Raw offal • Raw chicken neck • Pelleticized raw meat
Canned pet food	• Packed in cans or pouches • Shelf-stable at ambient conditions • Typically has a moisture content of 60 to 75% or aw ≥0.85	• Canned dog food
Heat treated refrigerated (wet) pet food	• Typically has a moisture content of 60 to 75% or aw ≥0.85	• Chilled dog rolls
Semi-moist pet food and treats	• May be shelf-stable at ambient conditions if mould growth is inhibited (e.g. by vacuum packaging and/or use of anti-fungal agent)	• Shelf-stable dog rolls • Soft jerky
Freeze-dried pet food	• May or may not be heat treated prior to freeze-drying	• Freeze-dried meat chunks
Dry pet food (kibbles) and treats	• Extruded, dried and baked • Shelf-stable at ambient conditions	• Dog biscuits • Kibble

Role of Carbohydrates

Carbohydrates digestion starts with mechanical breakdown of food in mouth but as there is less production of salivary α-amylase in dogs, due to it digestion not commence in mouth (Contreras-Aguilar et al., 2017). Pancreas release another enzyme commonly known as μ-amylase. If diet contains more starch the activity of μ-amylase also increases (Contreras-Aguilar et al., 2017). Extruded canine diets containing 35% to 40% DM of starch in the form of barley, corn, potato, rice, sorghum, or wheat all have starch digestibility > 99% (Rankovic et al., 2019). Dogs usually do not need carbohydrates for daily routein except when they are pregnant or under lactation period due to high energy demand (Ridgway, 2021). If carbohydrates free diet is used during pregnancy period it will results in fatal effects including high mortality rate of puppies as well as hypoglycemia and acetonemia in bitches (Bostrom et al., 2013; Jackson, 2022). It was determined that dogs are evolved from wolves (Axelsson et al., 2013) but the genomic sequencing reveals that dogs have 36 unique genomic regions containing 122 genes specific to dogs. Dogs also have pancreatic amylase genes which are dominant in expression as compared to gray wolves and dogs are evolved to digest starch rich contents in diet (Axelsson et al., 2013). Carbohydrates are a crucial part of dry commercial feeds of dogs. A recent survey found out that today almost 60% of the dogs were fed with commercial dry food daily (Dodd et al., 2019). Dry food is preferred by dog owners due to its easily availability, convenience, less cost, and availability of large range of products (Connolly et al., 2014). According to the recommend amount of fats and proteins by NRC, conventional foods for grown up dogs contains 78.8% of ME in the form of carbohydrates. Although wet foods too have carbohydrates but just for texture and gelatinization (Karr-Lilienthal et al., 2002).

Carbohydrates role in Development and Treatment of Conditions

1) Obesity

Most common nutritional disorder in dogs. Main cause is positive energy balance (dogs utilize less energy than what they are consuming) (German, 2006). In a study in 2010 it was reported that main factor which leads to the development of obesity is owner-specific practices like overfeeding and no exercises for their pet dogs (Bland et al., 2010). When starch is taken in excess amount it will either stored as glycogen or converted to body fats (Nelson & Cox, 2008). Carbohydrates conversion to body fat requires more energy than storage of dietary fats (Mattin et al., 2014) .Data about conversion of dietary carbohydrates into storage fats is unavailable in dogs. In a study it was reported that dogs who fed on high fatty diet consumed 13% more energy as compared to those who fed on high carbohydrates diet (Devic et al., 2016) .When high energy density diets are given to dogs they'll acquire their daily energy requirements even with a small volume of feed (Stubbs et al., 2000). Carbohydrates are mostly vilified as a major contributor to weight gain and proteins are considered as having contribution in weight loss. Furthermore there are many evidences to support role of dietary fibers in overweight or obese humans (Slavin, 2005). However, the inclusion of dietary fiber in weight-loss diets for dogs has provided greater effects on satiation, reductions in body fat, a higher percentage of weight loss, and reductions in voluntary energy intake (Hours et al., 2016).

2) Cancer

Prevention and management of cancer largely depends upon appropriate nutrition. Approximately, one in four dogs will develop cancer at any stage in their lifetime (Adams et al., 2010). As many type of cancerous cells need high energy demand for their effects on normal cells of body, they depend largely on glycolysis done by the normal cells (Klement & Kämmerer, 2011). In the development of cancer and its progression, the role of simple carbohydrate is under special consideration these days. *In-vitro* research shows positive correlation between insulin and

malignant cell proliferation but a less evidence is obtained on positive effects of *in-vivo* research on mice (Masur et al., 2011). Lactate produced as a result of anaerobic metabolism of carbohydrates which is largely required by the cancerous cells (Fadaka et al., 2017). Consequently, dogs suffering from cancer have higher concentrations of lactate and insulin than healthy dogs. So a diet with low carbohydrate concentration and high protein and fat concentration is preferable for dogs battling with cancer (Masko et al., 2010).

Role of Vitamins in Nutrition of Dogs

Vitamins are divided into 2 categories (A) Fat soluble vitamins (A, D, E and K) and (B) Water soluble vitamins (including B complex and C) (Youness et al., 2022). Mostly they are obtained from diet except for vitamin C which is synthesized from D-glucose in liver (NRC et al., 2006). Different vitamins have different roles like in maintaining health of skeleton, vision, reproduction and immune system. Yet their role and potential benefits in companion animals need to be understood carefully (NRC et al., 2006; Clarke et al., 2021; Tolbert et al., 2022). There are almost no *in-vitro* studies on the roles of vitamins in immune response and the two retrieved in this chapter mostly focused on vitamin C (commonly known as ascorbic acid) and vitamin E (known as α-tocopherol). Membranes of cells of immune system are made up of higher concentrations of polyunsaturated fatty acids due to which they mostly are sensitive to oxidative stress. This oxidative stress results in production of large amount of lipid peroxidases which have detrimental effects (Raederstorff et al., 2015). Vitamin E and C helps to protect cells by neutralizing the free radicals produced by the oxidative stress (Gordon et al., 2020). In addition to it, vitamin E shown to inhibit the production of inflammatory mediators like prostaglandin E_2 (PGE_2), interleukin (IL)-6 or tumor necrosis factor (TNF)-α in aged mice, in response to pathogens (Lewis et al., 2019). Similarly, vitamin C helps in improving immune responses, chemotaxis and phagocytosis of neutrophils, enhance proliferation of lymphocytes and helps in regulation of pro- and anti-inflammatory cytokines (Carr & Maggini, 2017). Further studies should be done for better understanding of the impacts of different vitamins on health of companion animals so that their feeds should be prepared according to the needs.

Role of Minerals in Dog's Food

These are the elements which required in small amounts just to maintain the normal regulatory mechanisms of body and are classified as macro and micro or trace elements (Ali, 2023). Calcium, potassium, sodium, magnesium, phosphorus and chlorine are essential macro mineral which are required by the dog whereas iodine, zinc, selenium, manganese, copper and iron are essential micro elements required by the dog (NRC et al., 2006). Their imbalance either in the form of excessive intake or low intake then required will result in health problems so their absorption, utilization and storage or excretion should be maintained (Pajarillo et al., 2021). There is only one study associated with evaluating the effects of calcium fructoborate as source of boron, however other *in-vivo* studies are mostly restricted to trace elements. Calcium fructoborate is a sugar-borate ester, a complex of calcium, fructose, boron, and can be found naturally in some fruits, vegetables, and nuts (Miljkovic et al., 2009). The CFB (Calcium fructoborate) is important for it's antioxidant and anti-inflammatory properties (Miljkovic et al., 2009; Scorei & Rotaru, 2011; Scorei & Scorei, 2013). Dogs with osteoarthritis that took a daily supplement containing CFB for 28 days had increased levels of sRAGE, a beneficial protein, compared to dogs that didn't take the supplement (Price et al., 2017). Dogs with osteoarthritis that were fed CFB supplements got some better standing up from a lying down position. Adding other supplements did not translate to additional benefits though. The efficiency of CFB might be breed size and age and condition severity dependent (Dong et al., 2022).

Animal feed contains trace elements in two forms e.g., some salts, e.g. carbonates or sulfates and organic (attached to an amino acid or other molecules) (Byrne & Murphy, 2022). Animal feed may not be as effective with inorganic trace minerals (bind to other substances such phytates and less available to the animals (Trevizan et al., 2013; Pereira et al., 2021; Wessels et al., 2021). Zinc needed for an effective immune system. Low levels of zinc can impair immunity and raise susceptibility to infections, autoimmune diseases and some cancers in humans and mice however there's poor understanding about effects of low zinc intake in canines (Wessels et al., 2021).

Types of Dog Food

During selection of food for a companion animal the most important thing to keep in mind is the nutrient contents. It doesn't mean to the exact level of nutrients but also their availability and digestibility (Case et al., 2010). Types of pet food include dry pet foods, semi moist pet foods and moist pet foods.

1) Dry Food

Most convenient and highly purchased food by the pet owners (Harlow, 1997). Because of their low moisture content as compared to wet and semi wet diets these are more economical and also can be stored well without being spoiled. The nutrient content recommendations for a dry dog food published by Case et al. (2010) are: approximately 26 % of crude protein; 15% shoul be crude fat; almost 5 % crude fiber; carbohydrate concentration about 37%; mineral content should be 7% and approximately 10% should be moisture content. Dry dog food is mostly preferable because it can be available to dogs for a time period without being spoiled.

Dry dog food is made up of carbohydrates (cereals), proteins (meat; fresh or frozen), byproducts or meals and lipids animal or plant of the following origins. The nature of their ingredient and way it is included (i.e. concentration or mixed or coated) will determine palatability (Thompson, 2008).

Dry dog food is usually strip packed in 3-11 % dry format, which makes up the brunt. It is energy efficient, capable of feeding large quantities of feed used and economically viable. The manufacturing process for making dog kibble is a topic known as extrusion. A basic extruder indeed consists of a barrel, helical screws, and a shaping die. Solid at room temperature; thus, extrusion of these ingredients need high temperature (over 150 °C), is obtained by means steam/hot water or other heat sources to breakdown or just soften (the common vegetable beater automatically soften when cut-and-used without pre-heating). Combustibles; material will melt the mix so it can be poured through the barrel. The high pressure applied to the batch causes it to pass through the die and exits out both side of and

finally extruder, it gets cut to the length desired by a rotating fly knife. In reality the extrusion process denatures some of Its nutritional values (Vondran, 2013).

Wet / Moist Pet Feed

Wet pet food is furthermore classified into many types out of which the primary two types are; those which contains proper and well balance nutrients and those that just supplies the dietary requirements in the form of treat containing meat or meat by-products. These are softer in nature than dry pet feeds which increase chances of their acceptability and palatability in some animals (Case et al., 2010). Wet foods contain higher proportion of dry matter of proteins and fats. Balanced wet foods are a mixture of meat, fish meat, poultry meat, vegetable proteins, vitamins and minerals. Canned dog food is often more aromatic and flavorful when compared to dry food. This may entice sick or older dogs to eat if their appetite is decreased. Wet food may be a good choice if your dog doesn't drink as much as he should, or if they have a medical condition that could benefit from proper hydration. One example would be a dog with a history of urinary or kidney disease. Dogs that have dental disease or other oral abnormalities may find wet food easier to chew than dry food. Wet dog food tends to create a longer-lasting feeling of being "full". Increased satiety is useful in weight management, especially in dogs that seem to have a never-ending appetite.

Conclusion

Choosing a good quality dog food is possibly the single most important decision you can make as a dog owner which will help in the long run health benefits. In such a wide range of dog food what to feed your dog depends on various things such as breed, age, size (or weight), health and most importantly their lifestyle. A good diet that is designed around your dog's nutritional needs can aid in maintaining their ideal weight, helping their immune system and alleviating some chronic disease risks. Selecting good dog food labels matter — watch out for whole food sources, same-named protein ingredients and whole grains. Do not use fillers, by-products or artificial preservatives because this will harm your dog. You should talk to a veterinarian when it comes to the proper diet which suits your dog's health needs or allergies. Along with the essentials of nutrition, also take into consideration what else is indicative for flavor preferences and demands from your dog. Dogs may need grain-free or minimal-ingredient diets, while others may need a senior or puppy formula. In the end, the best feed for your dog will be one that provide the nutrients they need and digestible ideal for optimal health and well-being. When it comes to dog food, making smart decisions can be the key to ensuring they have a better, healthier life. Ideally, you weigh your dog regularly so as to alter their diet if their energy level or stool quality are out of whack. The right feed and proper care help you to keep your dog healthy and supplying them some of the nutrients they need to survive.

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