
Vegan Dogs

Compassionate Nutrition

September 2011 version

Includes
a recipe for a
truly balanced and
complete vegan
dog food!



James O'Heare

Vegan Dogs: Compassionate Nutrition

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Table of Contents

Preface	2
Introduction	3
What is a Vegan Diet?	4
Why Vegan Diets for Dogs?	5
<i>Ethic Grounds</i>	5
<i>Environmentalism / World Hunger Grounds</i>	7
<i>Health Grounds</i>	7
Basic Nutrition Review	10
The Dog Digestive System	10
Nutrient Requirements of the Domestic Dog	14
<i>Carbohydrates</i>	14
<i>Protein</i>	16
<i>Fats</i>	18
<i>Vitamins</i>	19
<i>Phytochemicals</i>	21
<i>Minerals</i>	23
Life-Stage and Life-Style Nutrient Requirements	25
<i>Growth</i>	25
<i>Maintenance</i>	26
<i>Performance</i>	26
<i>Geriatric</i>	27
<i>Body Condition Scale</i>	27
Vegan Nutrition Issues	29
Concerns and Challenges to the Vegan Diet	29
The Most Common Concern: Protein	32
Specific Nutrients to be Concerned About	36
Super Foods	40
Caution	42
Monitoring	43
Vegan Diets	44
Home-Prepared Diets	44
<i>Recipe: Rice and Soybean Diet</i>	46
Some Vegetarian and Vegan Commercial Diets	48
Take Home Message	55
Myth Busting at a Glance	56
Resources	58
References	59
Vegan Dog Nutrition Certificate Course	61

Preface

This book is a work in progress. Check back frequently for updates. The version date will appear on the front cover. Consider joining the companion email list at <http://pets.groups.yahoo.com/group/vegandognutrition/>. The book's companion web page is at: <http://www.behavetech.com/vegandogs.html>

The focus of this book will be nutritional. For a more ethically themed book, I just love and always recommend *Obligate Carnivore Cats, Dogs, and What it Really Means to be Vegan 2nd edition* by Jed Gillen. I only wish I were as great a writer as Jed. Even re-reading it, I laugh out loud repeatedly with this book; it is hilarious and highly insightful philosophically. It is an excellent book and worth a read. You can find it at: <http://www.vegancats.com/>. I will not so much be trying to convince you of the desirability of a vegan diet for dogs but rather helping dispel some myths and arming you with some nutrition information you will need to make a vegan dog food work for you and your companion.

This book will likely be more information than the average dog guardian wants or needs and may be less information than some will want. For the latter, might I suggest picking up a copy of Case and colleagues (2000) and Hand and colleagues (2000), which you can find in the bibliography. These are not dedicated to vegan nutrition but they are excellent resources for further study. Case will be preparing a new edition soon. For the average dog guardian, I will try to include a "Take Home Message" box in advanced sections so you can skip ahead to it.

Introduction

Congratulations on your consideration of a vegan diet for your dog. This small book will outline some basic information on vegan diets for domestic dogs. The topic is important because many vegans have or wish to have companion dogs, but because a vegan will not purchase animal derived products, it is important for them to understand whether it is possible to safely provide a vegan diet to dogs. Some of the information here may be more in depth than the average dog guardian requires for determining whether a vegan diet is a plausible choice for their dog. My intension is to provide more in depth information so that the reader will be armed with the appropriate information to counter criticisms of their choice (common unfortunately). My intention in this work is to demonstrate that a vegan diet is a viable option for dogs.



There is much misunderstanding, mischaracterization and misinformation about vegan diets for dogs. Some people consider it "unnatural" (as if what they are feeding is "natural," and as if "natural" equates to optimal--a fallacy) while others believe that it is nutritionally inadequate (demonstrating a lack of knowledge in nutritional

sciences). Many people believe it is morally "wrong" because they believe that vegans are forcing their lifestyle choices on animals that are "carnivores." But these objections are just rhetoric and reflect ignorance. Most vegans do choose to feed their dogs a vegan diet because they believe it is unacceptable to kill some animals for the preferences of others, but critics assume a vegan diet is inadequate for dogs likely because of this [appeal to nature fallacy](#). This is of course faulty reasoning, which ignores the relevant principles of nutrition. ***The fact is that ALL essential nutrients required in the dog's diet can be met without any animal products whatsoever. Every single essential amino acid, fatty acid, carbohydrate (for energy), vitamin, and mineral can be provided quite adequately in a vegan diet in sufficient quantity and in reasonably bioavailable form for them to thrive.*** I'll refer the interested reader to *Small Animal Clinical Nutrition* 4th Edition by Hand, Thatcher, Remillard and Roudebush, and the National Research Council's *Nutrient Requirements for Dogs and Cats* for further details on the nutrient requirements of dogs and to confirm the fact that no animal products are required to meet those needs. These are the facts, regardless of some people's emotional responses and ignorance. And remember, uneasiness and concern is not a justified criticism of the diet. That said, when you narrow the choices of ingredient options to be used in a diet, it is indeed more challenging to formulate the diet. It does require more careful attention. This book is here to provide you with some basic information that will help you meet this challenge.

WHAT IS A VEGAN DIET?

A vegan diet is a diet that excludes animal meat, animal fat and animal derivatives such as milk, butter, eggs and cheese. The Vegan Society defines veganism this way: "The word 'veganism' denotes a philosophy and way of living which seeks to exclude—as far as is possible and practical—all forms of exploitation of, and cruelty to, animals for food, clothing or any other purpose; and by extension, promotes the development and use of animal-free alternatives for the benefit of animals, including humans and the environment. In dietary terms it denotes the practice of dispensing with all products derived wholly or partly from animals." (<http://www.vegansociety.com>)

WHY VEGAN DIETS FOR DOGS?

People may choose a vegan worldview for many reasons. Of course, the reasons can be a combination of these or include other reasons as well. We will break the reasons down into three broad categories (ethics, environment, health) and briefly discuss them.

Ethic Grounds

Ethics is the field of study dedicated to explaining, elaborating and justifying coherent principles and rules to govern social behaviors that significantly (nontrivially) impacts others. Perhaps more simply, ethics is the exploration of how we behave toward each other. There are many theories of ethics, most of which were thought up a long time ago by very mystically minded people with a set of wild assumptions. These days, the general consensus is that ethics is really just a set of social rules by which we operate, the objective being making society the best possible place it can be so that each of us may thrive. Some would disagree with this of course as there are so many wildly differing opinions on it. So, in ethics, we are talking about what we ought to do to ‘get along’ so to speak. We are interested in ensuring the most liberty possible in a society of individuals where conflicts of interests can arise.

We do not have the space here to get into great depth regarding the arguments for accepting a vegan worldview, but I will briefly review my own perspective. Basically, the principle of justice and liberty are important principles for ensuring a stable society in which to live. Justice refers to treating similar cases similarly and liberty refers to maximal freedom to contact reinforcers and minimal obstruction in our contacting reinforcers. Most people generally agree that these are important basic principles on which to formulate good rules to live by. One excellent rule that seems to be the basis for many ethical theories is to avoid harming others except in self-defense. In this context, we are talking about avoiding causing others pain, suffering and loss of opportunities to enjoy life by killing them, about not treating others as property. We commonly refer to this rule as having to do with rights. The question arises as to whom we apply this to.

Many people believe that the rule is applicable to how we treat other humans and only humans (although these same people also tend to agree that it is “wrong” to unnecessarily cause nonhuman animals pain and suffering). But, the vegan worldview rejects this distinction as unjust discrimination. The vegan worldview suggests that species membership is not relevant and that the only truly relevant feature for inclusion in the rule is that it ought to apply to individuals who are capable of experiencing said pain and suffering or loss of opportunity to enjoy life. Therefore, the vegan worldview respects the rights claims for all individuals who have interests in not experiencing pain, suffering and loss of opportunity. For a more in-depth treatment of this topic, see the sentient beings rights project <http://www.sbrproject.com/>. Vegans recognize that being a consumer of animal “products” is to cause the pain and suffering that the animal-use industry inflicts in order to produce its goods and services. They simply refuse to participate in this causal relationship. We do not *need* these products; they are mere preferences. Luckily, it is quite easy to maintain a dog on a vegan diet and have them thrive on it.



Environmentalism / World Hunger Grounds

Gillen (2003/2008) reports that the production of a standard quarter pound hamburger requires 625 gallons of water, the destruction of 55 square feet of rainforest, and wastes 50 times more fossil fuel than would the production of the same amount of vegetarian food. It is estimated that as much as 16 pounds of grain and soybeans are needed to produce one pound of beef (Eisman, 2003). 80% of grain grown in the U.S. is used to feed food animals (even more dire now that we are also using grain to produce more fuel). Of the incredible amount of pesticide used on them, 1% ends up on the grain and that grain is destined for food animals. It is not washed off so it concentrates in their bodies. This is then eaten by people and companion animals. The other 99% of pesticide ends up in the wind and water in our environment (Eisman, 2003). For more information on the impact of meat production on the environment, a good introduction is [Veganism The New Ethics of Eating](#) by Erik Marcus. Food-animal use is just plain bad for the environment (and also world hunger, as you can see also).

Health Grounds

Some guardians opt for a vegan diet for health reasons, although I am personally less inclined to make this a basis for adopting a vegan diet for dogs. (This is definitely strong grounds for humans to adopt a vegan diet for themselves). On the home page, [Knight \(http://www.vegepets.info, 2005\)](#) describes the problem this way:

“The health hazards of commercial meat-based pet foods are extensive, and difficult to avoid. They may include slaughterhouse waste products; 4-D meat (from dead, dying, diseased or disabled animals); old or spoiled supermarket meat; large numbers of rendered dogs and cats from animal shelters; old restaurant grease, complete with high concentrations of dangerous free radicals and trans fatty acids; damaged or spoiled fish, complete with dangerous levels of mercury, PCBs and other toxins; pathogenic bacteria, protozoa, viruses, fungi and prions, and their associated endotoxins and mycotoxins; hormone and antibiotic residues; and dangerous preservatives. The combined results are

rendered so delicious to cats and dogs by the addition of ‘digest’ - a soup of partially dissolved chicken entrails - that more than 95 % of companion animals subsist primarily on commercial meat-based diets.

“Unsurprisingly, diseases described in the scientific literature following long-term maintenance of cats and dogs on commercial meat-based diets include kidney, liver, heart, neurologic, eye, musculoskeletal and skin diseases, bleeding disorders, birth defects, immunocompromisation and infectious diseases. As a practicing veterinarian I agree that so-called degenerative diseases such as cancer, kidney, liver and heart failure are far more common than they should be, and that many are likely to be exacerbated or directly caused by the numerous hazardous ingredients of commercial meat-based cat and dog diets.” Knight defends this perspective by citing the studies at:

http://www.vegepets.info/pages/meat_based_commercial_diets.htm#AppendixStudies

This is a controversial position. Opponents argue that the risks are actually associated with low quality byproduct-based diets and that overweight dogs are simply overfed a high calorie diet. Is meat the main problem per se or is it the low quality ingredients and poor manufacturing process? Knight argues that meat itself is at least a big part of the problem. It should also be noted that there are serious hazards associated with poorly handled cereal-based commercial foods in the form of aflatoxins, endotoxins and various mold based problems associated with grains (Susan Dillon, personal communication, April 2, 2008). This is a risk in both meat-based and vegan commercial diets. See PETA (1994 at http://www.vegepets.info/pages/vegetarian_canine_diets.htm#HealthSurvey) for more information on the health issues of vegan versus nonvegan diets for dogs.

Dogs on vegan diets are anecdotally noted for maintaining an ideal, lean body condition and good health (Knight, 2005; PETA, 1994). Although humans are naturally more herbivorous (see <http://www.goveg.com/naturalhumandiet.asp>), dogs are more omnivorous (or “carnivorous” if you insist). They are more tolerant of cholesterol and less susceptible to illness from foodborne pathogens. The problem is more in terms of

poor ingredient choice, production issues and the shedding of pathogens into the environment where the less tolerant human immune system can become compromised by them. The byproducts and toxins that make up much commercial dog food is far from merely a matter of “meat” versus non meat, which leads me to my next clarification.

I am *not* saying that a vegan diet necessarily is always more healthy for dogs than a meat-based diet. Nor will I personally rest my argument for a vegan diet for dogs largely on health grounds. What I *am* saying is that, properly done, a vegan diet is a perfectly viable option and is not inherently *less* healthy than other diets. Although perhaps not more healthy than many diets, a properly formulated vegan diet may be more healthy than many of the most popular and common commercial diets available. See Gillen (2003/2008) for an elaboration on the use of health grounds in arguing for a vegan diet for dogs.

Take Home Message

You might consider a vegan diet for your dog for any of various reasons. Usually, it is for ethical reasons. Vegans do not consume animal-based products because they wish not to cause pain and suffering to others. This includes purchasing it for our companion animals. The animal-use industry also takes a heavy toll on the environment and contributes to world hunger, the effects of which can be minimized by a lifestyle that promotes much less negative impact on other animals. Others move to a plant-based diet to avoid the byproducts and other contaminants and toxins common in many, if not most or all, commercial meat-based dog foods.

BASIC NUTRITION REVIEW



THE DOG DIGESTIVE SYSTEM

Having an appreciation for the fundamentals of the digestive system will help you appreciate how nutrients are assimilated by the body. Much of this section is derived from Collins (1994).

The digestive system of the dog is a long tube from the mouth to the anus. “Digestion is the process whereby a biological entity processes a substance, in order to chemically convert the substance into nutrients. Digestion occurs at the multicellular, cellular, and sub-cellular levels.” (<http://en.wikipedia.org/wiki/Digestion>).

Digestion begins in the mouth. The parotid glands, located below the ears; the mandibular glands, located in the jaw region; and the sublingual glands, located below the tongue, produce saliva, which moistens food. Food is mechanically broken down and mixed with the saliva, which contains mucous, and helps coat food to assist swallowing. (Collins, 1994)

The lips are used to manipulate food into the mouth, the tongue is used to guide food to the teeth and the teeth are used to masticate the food items, breaking it down into smaller particle sizes. This is the beginning of mechanical digestion. The upper surface of the tongue contains the papillae, which contain the taste buds. These are structures of the nervous system that allow the dog to perceive sour, bitter, sweet, and salty tastes. Teeth can be used to grind food into smaller chunks starting the process of breaking food down mechanically, but dogs often just gobble food down in chunks just big enough to swallow. (Collins, 1994)

The bolus of food goes from the mouth to the pharynx at the back of the throat. When swallowing, the epiglottis closes, preventing food from entering the airway instead of the digesting tract. Next, food goes into the esophagus, which is a long muscular tube going from the throat to the stomach. We can refer to the cervical (neck) esophagus, thoracic (chest) esophagus, and the abdominal esophagus. (Collins, 1994)

The cardiac sphincter is the muscle that separates the esophagus from the stomach and regulates access to the stomach. It relaxes and allows food to enter the stomach and then immediately constricts, preventing reflux. The stomach is the next stop, where the bolus is held. Enzymes, mucus, and hydrochloric acid are secreted into the stomach where they begin the process of chemical digestion and, importantly, kill some bacteria, viruses, protozoa, fungi and other potentially pathogenic organisms that may have entered with the food. The stomach has several functions: it acts as a reservoir, it adds digestive enzymes to food and it acts as a regulator valve that controls flow rate into the small intestine. The stomach initiates protein digestion. (Collins, 1994)

The stomach secretions contain proteases (protein digesting enzymes), hydrochloric acid and mucous. Pepsinogen is the inactive form precursor for pepsin and is converted in the presence of hydrochloric acid. This enzyme begins the hydrolysis of protein into polypeptide units. Hydrochloric acid maintains proper pH so enzymatic action occurs and slightly alters the composition of ingested fat and protein in preparation for more digestive enzymes in small intestine. Mucous lubricates food and protects the lining of the stomach from its own digestive enzymes.

Peristaltic movements of the stomach mix food with secretions and prepare it for entry into the small intestine. It is pushed toward a ring of muscle called the pyloric sphincter. The food is now a thick, milky semi-liquid called chyme. The pyloric sphincter relaxes in response to peristaltic contractions of the stomach and allows small amounts of chyme to pass into the duodenum. (Collins, 1994)

The small intestine is about 3.5 times the length of the animal. It is in the small intestine that the nutritional contents of the chyme are absorbed into the bloodstream. The small intestine has three segments: the duodenum, which is the first part, which is about 10 inches or 25.4 centimeters; the jejunum, which is the longest part; and the ileum, which is rather short at about 5.9 inches or 15 centimeters. The duodenum is the main site of digestion. More enzymes are added, some of which come from the pancreas and other glands located in the intestinal wall. Opponents of a vegan diet for dogs often point to the fact that dogs do not produce salivary amylase (as, for example, humans do) to suggest that dogs cannot digest carbohydrates, but dogs do produce pancreatic amylase that allows the dog to digest carbohydrates in the small intestine. The pancreas secretes large volumes of bicarbonate salts, which neutralize acidic chyme and provide proper pH for pancreatic and intestinal enzymes. These include proteases to continue protein digestion, maltase, lactase and sucrase for final digestion of carbohydrates and lipase for fat digestion. They enter the small intestine through the pancreatic duct. (Collins, 1994)

Bile is produced in the liver and stored in the gall bladder. Its primary function is emulsification of ingested fat and activation of certain lipases. Fat is turned into micelles,

which are tiny water-soluble globules. Micelles are acted upon by lipase and eventually absorbed through the intestinal wall into the blood stream. The liver also converts glycogen, the storage form of sugar, into sugars that the body can use for quick energy. (Collins, 1994)

The hormones secretin and pancreaticozymin also play a part in digestion. Secretin, which is produced in the duodenum wall, stimulates the release of bicarbonate and controls bile flow rate from the gall bladder. Pancreozymin stimulates the gall bladder to release bile and also stimulates the secretion of pancreatic enzymes.

Two types of movement take place in the small intestine: peristalsis, and segmentation. Peristalsis is a worm like motion that helps move the chyme through the intestine and segmentation consists of contractions that help break the chyme down. Digestion is finished up in the small intestine. Once the chyme is broken down to its simplest forms, it is absorbed by the body into the blood or lymphatic system. The small intestine is very long and absorption takes place along its length. Mucosal folds, villi, and minute projections covering the surface of each villus, microvillus, increase the inner surface area by approximately 600 times that of the outer serosal layer of intestine. This increases the surface area for absorption. Sugars and amino acids are transported to the liver via the portal vein where they are further processed. (Collins, 1994)

The remaining mixture moves next to the large intestine. First, it passes through the cecum, which is a small pouch between the small and large intestine, and then into the colon. Water is absorbed and some fermentation of dietary fiber by bacteria takes place. Some fibers, which resist digestion in the small intestine, ferment in the large intestine, which results in the production of short chain fatty acids and gases. These short-chain fatty acids are a source of energy for intestinal cells. The turnover rate for these intestinal cells is rather high so they require a high level of energy to function properly. Finally, the rectum temporarily stores non-digestible material (feces) until it is evacuated through the anal sphincter. This is called defecation. (Collins, 1994)

Take Home Message

The dog's digestive system is like a big tube from mouth to anus. Food is mechanically broken down with the teeth and then moves into various stages of chemical breakdown and digestion where the nutrients in the food are metabolized and used to maintain the body. The dog's digestive tract is thought by some to anatomically and physiologically reflect that of an omnivore (tends to consume both plant and flesh) and by others, that of a carnivore (tends to consume flesh). This is based on the fact that dogs tend to have shorter digestive tracts and faster metabolism, which means that it takes less time for food to get through the digestive tract, and because they have tearing teeth and do not produce enzymes in the mouth for breaking down carbohydrates (although they do produce these enzymes for digesting carbohydrates in the pancreas). Dogs are not as carnivorous as cats or ferrets for instance, but they are also not as herbivorous as humans. And so, they are somewhere in the middle. Luckily with a little care, dogs can thrive on a vegan diet composed of plant-based ingredients and appropriate supplementation. The fact that dogs have an anatomy and physiology that is more carnivorous than rabbits or cows, for instance, is a common argument for why dogs should only be fed a meat-based diet. This is simplistic though, since the dog is quite capable of thriving on a properly formulated plant-base diet. Don't be fooled by this false argument.

NUTRIENT REQUIREMENTS OF THE DOMESTIC DOG

Carbohydrates

It is often argued that dogs have no “essential requirement” for carbohydrates but this is misleading. Humans do not have an “essential requirement” for carbohydrates either. But carbohydrates are nonetheless very important in a dog's diet. Dogs have energy requirements. You can meet these energy requirements with protein, but it is generally expensive and protein is required in the body for other very valuable purposes such as building bodily structures. Carbohydrates are converted to glycogen, which is used by the liver for quickly accessible energy and by the brain to keep us alert and thinking clearly

(Collins, 1994). Carbohydrates are also, as indicated above, “protein sparing,” meaning that they spare protein from meeting energy requirements so it can be used for its more important role in building and maintaining bodily tissues, something only protein can achieve. Meeting energy needs with carbohydrates spares the protein, allowing it to be used for its more valuable tasks and lightens the load on the kidneys. Moreover, carbohydrates come with valuable fiber, promoting gastrointestinal health, and they provide important phytochemicals not found in meat ingredients.

Usually the way a diet is formulated is to provide sufficient but not excess protein and fat and then provide sufficient carbohydrates to bring the energy density to an optimal level. Dogs usually eat to energy requirements, not nutrient requirements (unless the food is very energy dense), so by using carbohydrates to bring the diet to the correct level so that the dog will get just the right quantity of their essential nutrients we optimize the diet. In other words, carbohydrates provide an efficient source of energy in the diet. Saying carbohydrates are not an “essential requirement,” may be technically true in a specific nutritional sense but is misleading because carbohydrates can play a vital role in the dog’s diet.

This is not to perpetuate the myth that vegan diets are necessarily excessive in carbohydrates. You can formulate vegan diets that are high in protein and fat. But I did want to discuss that topic because it is a common pitfall for those without an understanding of the topic and is touted on email lists and in books alike as an argument to avoid vegan diets for dogs. As you can see, it is based on a misunderstanding of the role of carbohydrates in the diet. Good sources of carbohydrates can be found in beans and bean products, wheat, rice, barley, and oats.

Protein

Protein is involved in many functions and especially in building bodily tissues, including muscle. Proteins are simply chains of amino acids with approximately 16% nitrogen (Case et al. 2000, p. 99). Animals have a requirement for specific amino acids (10 for dogs) and for a certain amount of nitrogen. Protein can be used as an energy source when carbohydrates (which do not tax the kidneys as heavily) are not available and they are used to build many bodily structures. They particularly help the dog maintain their muscle mass. Many people's first question about vegan diets, where do they get their protein? They make the mistake of thinking of plant ingredients (e.g., vegetables, seeds, fruits and grains) as carbohydrates and meat as protein. It is true that most plant ingredients are proportionally higher in carbohydrates than most animal ingredients, but each specific ingredient usually has a combination of macronutrients in them (except oils, which are just lipids). Muscle and organ tissue contain mostly protein and fat with no fiber. Plant-based ingredients contain varying ratios of carbohydrates (including fiber), fatty acids and amino acids. Plant-based ingredients also come with important phytochemicals that cannot be found in animal products. Avoid the common myth that without meat there is no protein. As you will see below, there are many good plant-based sources of protein. I encourage you to use the USDA nutrient database (<http://www.nal.usda.gov/fnic/foodcomp/search/>) and the easier to use NutritionData.com (<http://nutritiondata.com/index.html>) as resources for identifying good protein (and other) sources. The important thing to remember here is that protein, and more specifically amino acids and nitrogen can be found in many different food sources. There are 10 essential amino acids for the dog: arginine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine.



Arginine: Vital for protein synthesis and an essential component of the urea cycle to rid the body of toxic ammonia. It also helps keep liver, skin, joints and muscle healthy and promotes a healthy immune system.

Histidine: Important for building and maintaining healthy tissues throughout the body. In particular, it helps build myelin sheaths, the coating on nerve cells that helps ensure effective nerve impulse transmission. Also important in pain control.

Isoleucine: Important, along with leucine and valine, for endurance as well as healing of muscle tissue in injury recovery. It also helps with blood clotting. Isoleucine is all about energy and healing.

Leucine: Important, along with isoleucine and valine in repair of damaged muscle tissue as well as in blood sugar regulation and energy.

Lysine: Component of various tissues throughout the body. Important for bone growth in puppies.

Methionine: Helps the body manage fat, and helps maintain proper urinary pH levels. Required for the body to produce cysteine and taurine, which is valuable for building tissue, eliminating toxins and maintaining cardiovascular health.

Phenylalanine: Important for choleceptokinin enzyme production and is therefore related to appetite control and blood pressure. Contributes to tyrosine, which competes at the blood brain barrier with serotonin for access to the brain and is therefore related to mood and behavior.

Threonine: Important for proper protein balance within the body. It works with phenylalanine in mood elevation and is related to skin pigmentation. Important for liver function and immune system function.

Tryptophan: Important as a precursor for serotonin, a neurotransmitter involved in maintaining mood, which promotes relaxation, calmness and contentedness. Important in the sleep cycle along with melatonin.

Valine: Important, along with isoleucine and leucine, in maintaining blood sugar levels, tissue repair and energy. Also important for mental function.

Note: Cysteine and tyrosine are unique among the nonessential amino acids. Cysteine is synthesized by the body from methionine, so it is not considered essential. Vitamin B is necessary for this synthesis to occur. The problem is, the necessary synthesis can take up to 50% of the methionine in the body. The same is true of tyrosine. It is synthesized from phenylalanine, that thus is not truly essential, but it also takes up to 50% of the phenylalanine in the body. So these two are not in the true sense of the word "essential" because they can be synthesized by the body, but they use up a tremendous amount of other amino acids in their synthesis.

I will discuss protein further below.

Fats

Fat or lipids are made up of component fatty acids. Fatty acids can be derived from either animal or vegetable sources. Animal sources are usually saturated fats, while vegetable sources are usually monounsaturated or polyunsaturated. Fats are used as an energy source and to promote growth and healthy skin. Dogs have a dietary requirement for a particular type of fatty acids called linoleic acid (a.k.a. omega 6 fatty acids). They can synthesize all the required fatty acids in their body except for this linoleic acid, which is why it is required in the diet. Safflower, sunflower and corn oils are high in linoleic acid and hence are great sources of fatty acids in the dog's diet. Linolenic (or omega 3) fatty acids are now considered essential as well (Hand, Thatcher, Remillard & Roudebush, 2009). Soybeans contain both linoleic and linolenic fatty acids and so might make a good ingredient in a dogs diet. Evening Primrose oil is a good source of omega 3 fatty acids too.

Vitamins

Much information in this section is derived from Hand, Thatcher, Remillard and Rodebush, (2000), and Eisman (2003). Vitamins and minerals are important in the diet and serve many functions. Fat soluble vitamins are stored in fat whereas water soluble vitamins are not. Water soluble vitamins need to be replenished frequently because they are excreted and so what is not used goes right through. Here are the vitamins required by dogs:

Fat Soluble Vitamins

Vitamin A: Preformed vitamin A (most notably retinol) is an animal derived product whereas beta carotene is a yellow-orange pigment common in many plants, which is easily converted by the body to vitamin A. It is required for vision, bone growth, immune and other functions.

Vitamin D: Also known as calciferol, it is found in D2 (ergocalciferol, non-animal product) and D3 (cholecalciferol, usually derived from lanolin (wool) or fish but can be produced synthetically). Vitamin D is really a hormone, but is often considered a vitamin. It is vital for insulin synthesis, bone health and immune function.

Vitamin E: Also known as tocopherol. Vitamin E is a strong antioxidant, helping deal with free radicals that can cause cancer and is commonly used as a kibble preservative.

Vitamin K: Also known as phyloquinone. Particularly important in blood coagulation.

Water Soluble Vitamins

Thiamin (B1): Helps burn calories in carbohydrates and good for the nervous system.

Riboflavin (B2): Good for the nervous system.

Niacin (B3): Helps with digestion.

Pyridoxine (B6): Involved in amino acid metabolism.

Pantothenic acid: Involved in the metabolism of protein, fat and carbohydrates

Folic acid: Also known as folacin. Important for red blood cell development.

Biotin: Important for metabolism of lipids, glucose, some amino acids and energy.

Cobalamin (B12): Important for red blood cells and nerve cells. Particularly important for vegans because it must be supplemented.

Ascorbic acid (C): Vitamin C is most notable for being an antioxidant and free radical scavenger.

Choline: Another “vitamin” that is not technically a vitamin. It supports metabolism.

Carnitine: This vitamin-like (and amino-acid like also) substance is similar to a vitamin but, again, not technically a vitamin. L-carnitine is biosynthesized from the amino acids lysine and methionine and helps transport long-chained fatty acids across the mitochondrial membrane into the mitochondrial matrix. Not considered essential by many, it is rarely supplemented into formulated diets, but some sources claim that it may be important, along with taurine, in preventing certain heart diseases, and to be safe, many people supplement diets with L-Carnitine in case this is true.



Phytochemicals

And lest we forget the many other substances that are thought to do the body good:

Phytochemicals are sometimes referred to as phytonutrients and these terms are often used interchangeably. Most broadly defined they could be said to be any chemical or nutrient derived from a plant source. “However, in common usage they have a more limited definition. They are usually used to refer to compounds found in plants which are not required for normal functioning of a body but which nonetheless have a beneficial effect on health or an active role in the amelioration of disease. Thus, they differ from what are traditionally termed nutrients in that they are not a necessity for normal metabolism and their absence will not result in a deficiency disease -- at least not on the timescale normally attributed to such phenomena; although not mainstream, some would claim that many of the diseases afflicting the people of industrialized nations are the result of those people's lack of phytonutrients in their diet. What is beyond dispute is that

phytonutrients have many and various salubrious functions in the body. For example, they may promote the function of the immune system, act directly against bacteria or viruses, reduce inflammation, or be associated with the treatment and/or prevention of cancer, cardiovascular disease or any other malady affecting the health or well being of an individual.” (<http://community.livesuperfoods.com/?p=91>)

Families of Phytochemicals

The following are groups or families of related phytochemicals and common sources for phytochemicals arranged by family.

Family	Sources
Flavonoids	berries, herbs, vegetables
Isoflavones (phytoestrogens)	barley, flaxseed, soy
Organosulfur compounds	chives, garlic
Saponins	beans, grains
Capsaicin	hot peppers
Isothiocyanates	cruciferous vegetables
Monoterpenes	citrus peels
Sterols	vegetable oils

Food Processing and Phytochemicals

Phytochemicals are thought to be destroyed or removed by many modern food-processing techniques, including possibly cooking. For this reason, it is believed that industrially processed foods are less beneficial (contain fewer phytochemicals) than unprocessed foods. The absence or deficiency of phytochemicals is believed to have contributed to the increased prevalence of the above-cited preventable or treatable causes of death in contemporary society. Interestingly though, lycopene which is a phytonutrient

that can be found in tomatoes, is concentrated in processed foods such as spaghetti sauce or ketchup making those foods much better sources of that compound than simply eating tomatoes themselves.” (<http://en.wikipedia.org/wiki/Phytochemical>)

For a more detailed review of phytochemicals see:

<http://www.benbest.com/nutrceut/phytochemicals.html>

Minerals

Much information in this section derived from Hand, Thatcher, Remillard and Rodebush, (2000), and Eisman (2003). Minerals are inorganic substances required in the diet. Here are some important minerals.

Calcium (Ca): Important for bones, teeth, muscle function and neural processes.

Phosphorus (P): Important for bone and teeth health and metabolism of protein, fat, phospholipids and energy production.

Potassium (K): Electrolyte. Important for muscle contraction and transmission of nerve impulses.

Sodium (Na): Electrolyte. Important for transmission of nerve impulses and osmotic pressure.

Chloride (Cl): Electrolyte. Important for transmission of nerve impulses and osmotic pressure.

Magnesium (Mg): Important as a component of bone and intracellular fluids, neuromuscular transmission, component in some enzymes, and metabolism of carbohydrates and lipids.

Iron (Fe): Important constituent of enzymes and for oxygen transportation in red blood cells.

Copper (Cu): Copper is a component of some enzymes and a catalyst in hemoglobin formation, cardiac function, cellular respiration, bone formation and immune function.

Manganese (Mn): Important as a component and activator of enzymes, fat and carbohydrate metabolism and bone development.

Selenium (Se): Important as an antioxidant because it is a component of glutathione peroxidase.

Iodine (I): Component of thyroxin, a hormone regulating basal metabolic rate.

Boron (B): Regulates parathyroid hormone, influences metabolism of calcium, phosphorous, and magnesium.

Chromium (Cr): Potentiates insulin action, and improve glucose tolerance.

Take Home Message

Dogs have requirements for protein, fat, and water in their diet and carbohydrates can serve a vital role as well. Protein tends to help build and maintain bodily structures like muscle and other tissues. Fats are a good energy source and carry some vitamins. Carbohydrates provide mainly energy, used to keep the mind and body running smoothly. They also allow protein to do its job rather than also having to also provide energy. There are various vitamins and minerals needed to keep the body running and these are generally found in plant based plant ingredients. There are a couple of nutrients that dogs need but which are not found in plant ingredients. These are easily supplemented in synthetic form though, and so this does not pose a problem at all. In fact most commercial meat-based diets use these same synthetic nutrients because the ones in their meat ingredients are destroyed to some extent in the manufacturing process. Every single nutrient that a dog needs to thrive can be provided in plant based ingredients or in supplements.

LIFE-STAGE AND LIFE-STYLE NUTRIENT REQUIREMENTS

Throughout a dog's life, their nutritional requirements change. You will find here some very cursory guidelines on these requirements. Not everyone will be interested in this topic. Feel free to skip it if you like. Have a good look at the body condition scale though and the link to 'see pictures'. You want to be able to know what is over- and under-weight in evaluating the health of your dog.

Growth

The mother's milk (and the colostrum it contains during the very short time after birth) provides not only excellent nutrition to newborn puppies but also passive immunity to

various potential pathogens. Puppies will not develop their own immunity for around 6-12 weeks, so receiving adequate colostrum in the first 24 hrs is very important (Andrew Knight, personal communication, March 2008). Another possible benefit is that if the mother is vegan then the puppies will be predisposed to eat vegan food. They will probably be more likely to prefer the ingredients the mother was eating, which can make it easier to feed this dog later in life. At about 3 to 4 weeks of age, you can start supplementing the mother's milk with solid foods, ideally a food that is moistened into 'gruel' at first. At about 7 weeks, the puppies should be completely weaned. The energy requirements for puppies are about twice that of adults. Large or giant breed dogs should not be fed a very high-energy food because that would promote quick growth, which is not good for the skeletal structure. Moderate growth in large and giant breeds is optimal. Protein should be at about 25% to 29% of metabolizable energy (Case et al. 2000, p. 249). Fat should be at about 17%.

Maintenance

Protein should be at about 18% of metabolizable energy (Case et al. 2000, p. 104) or 15% to 30%, and fat at about 10 to 20% (Hand et al. 2000, p. 223). Feed an amount that maintains an ideal body condition.

Performance

Protein should be at about 25% to 35% of metabolizable energy and fat at about 20% to 30% for very active dogs. Performance does not mean daily jogging but rather high levels of intense activity. Feed to maintain proper body condition. For endurance sports, increase fat content slightly. Ensure the diet is energy dense so that the dog is able to get the calories required in an amount that is reasonable to consume. Corn oil and soybeans or tofu, or even soy protein isolate, are good choices for increasing energy density. Feed 1.5 to 2 hours before the dog exercises and feed a carbohydrate containing supplement immediately following endurance exercise to replenish glucose levels (Case et al. 2000, p. 265).

Geriatric

This stage usually begins between 5 and 7 years of age but probably has more to do with the activity of the dog. Many dogs are active for an extended time and may not require geriatric adjustments until they are 9 or 10. Smaller dogs tend to reach geriatric age later than larger dogs. By the way, one of the purported longest living dogs lived to be at least 27 and was a vegan. Energy requirements are reduced by about 30% to 40% in most older dogs (Hand et al. 2000, p. 282). Many geriatric dogs have medical problems that will result in different nutritional needs.

Discussion of nutritional therapy for medical problems is beyond the scope of this book. Refer to a veterinary nutritionist for consultation on meeting the nutritional needs of dogs, old or young, with medical problems that affect nutritional requirements.

Body Condition Scale

For illustrations of these levels see: <http://vet.osu.edu/1851.htm> and the information below comes from this source and <http://www.purina.com/dogs/health/BodyCondition.aspx>.

1. EMACIATED Ribs, lumbar vertebrae, pelvic bones and all bony prominences evident from a distance. No discernible body fat. Obvious loss of muscle mass.
2. VERY THIN Ribs, lumbar vertebrae and pelvic bones easily visible. No palpable fat. Some evidence of other bony prominence. Minimal loss of muscle mass
3. THIN Ribs easily palpated and may be visible with no palpable fat. Tops of lumbar vertebrae visible. Pelvic bones becoming prominent. Obvious waist and abdominal tuck
4. UNDERWEIGHT Ribs easily palpable, with minimal fat covering. Waist easily noted, viewed from above. Abdominal tuck evident.
5. IDEAL Ribs palpable without excess fat covering. Waist observed behind ribs when viewed from above. Abdomen tucked when viewed from the side.

6. **OVERWEIGHT** Ribs palpable with slight excess fat covering. Waist is discernible viewed from above but is not prominent. Abdominal tuck apparent.
7. **HEAVY** Ribs palpable with difficulty, heavy fat cover. Noticeable fat deposits over lumbar area and base of tail. Waist absent or barely visible. Abdominal tuck may be absent.
8. **OBESE** Ribs not palpable under heavy fat cover, or palpable only with significant pressure. Heavy fat deposits over lumbar area and base of tail. Waist absent. No abdominal tuck. Obvious abdominal distention may be present.
9. **GROSSLY OBESE**. Copious fat over chest, spine and tail base. Waist and abdominal tuck absent. Fat deposits on neck and limbs. Abdomen distended.

Vegan Nutrition Issues



CONCERNS AND CHALLENGES TO THE VEGAN DIET

Many people are opposed to a vegan diet for dogs. Many of the arguments against a vegan diet for dogs are emotional and rhetorical and not worthy of serious consideration. Here I will address two arguments. The first is of primary interest and the second, while common, is more obviously specious. One argument (argument #1) proposes that dogs should not be fed a vegan diet because it is insufficient or not optimal; that the dog's nutrient

requirements are either not present or present but not sufficiently digestible in plant based ingredients. Another argument (argument #2) is that the vegan diet is not natural and therefore is inappropriate.

Argument # 1, that the vegan diet cannot be sufficient or optimal, is addressed by the information discussed throughout this book, namely that every single nutrient a dog requires can be met without animal products. Many dogs have thrived on such diets for many years. Again, I am not positing the argument that vegan diets will always be superior to all other diets. This standard is inappropriate. I am arguing that a vegan diet is not less nutritious than other diets if formulated properly and that it is a perfectly viable choice for anyone who wishes to take advantage of it.

Argument #2, the argument that the vegan diet is inappropriate for dogs because it is not natural assumes that a plant based diet is unnatural and that unnatural must be equated with insufficient. As will be discussed below, the vegan diet may not be “natural” but this is in fact irrelevant to whether it can provide adequate nutrition for a dog to thrive on. This argument commits what is called the [naturalistic fallacy](#).

Dogs are members of the taxonomic order Carnivora. Some people mistakenly take this in a nutritional sense. Most members of the order Carnivora are in fact carnivores nutritionally but some are not (and in fact are near vegan “naturally”). Dogs may be better described as omnivores in a nutritional sense, although I am not opposed to considering them nutritional carnivores (that is, tending to eat a meat-based diet). Whether feeding a vegan diet is adequate or not certainly does not rest on whether we call dogs omnivores or carnivores. Dogs evolved from wolves, which are nutritionally carnivores. In the last 14,000 years, dogs have evolved into what many refer to as nutritional omnivores, because of their association with humans. The most prominent and generally accepted theory regarding the speciation event of the domestic dog suggests that dogs evolved initially by feeding on societal wastes from human populations (Coppinger & Coppinger, 2001). In many areas where this took place, and in some cases still does, these wastes are almost entirely plant sources of energy, protein, carbohydrates, fats and micronutrients. Dogs became scavengers of a mixed diet and this applied a strong selective pressure on the dog’s appetitive behaviors and digestive system. That said, what is “natural” is irrelevant. Regardless of this history, dogs are capable physically of meeting their nutritional requirements without the need for animal products.

“Natural” must not be confused with sufficient or optimal. Invoking the term “natural” does not tell us whether a particular diet is sufficient or optimal to meet the dog’s daily nutrient requirements. I will use the term “optimal” here to mean “meeting an individual’s nutritional requirements rather efficiently,” and I will use the term “sufficient” to mean “meeting the individual’s nutrient requirements effectively at least moderately efficiently, certainly at an acceptable level.” The diet composed of meat and other ingredients, if formulated to be balanced and complete, is usually sufficient and often optimal. This cannot be denied. Diets without animal products can also be formulated to be balanced and complete, easily meeting the sufficiency criterion and the optimum criterion as well, if formulated with care. The term “unnatural” is a rhetorical device that is vague and misleading in this case. The better approach is to look at the nutritional requirements of a species and identify ingredients that can meet those requirements. It is not a matter of rhetoric but rather nutritional science.

“Dogs require specific nutrients, not specific feedstuffs”

- National Research Council. (1985). Nutrient Requirements of Dogs, National Academy Press: Washington. p. 3.

The most important principles to understand here is that ***dogs do not have specific ingredient requirements; they have specific nutrient requirements***. We briefly listed above which amino acids, fatty acids, micronutrients and how much energy a dog must achieve from their diet. This next part is important now. ***Every single nutrient that a dog requires can be achieved without any animal ingredients whatsoever***. Is it the only diet choice available? Of course not. Is it always superior to nonvegan diets in a nutritional sense? Perhaps not. It certainly causes the least suffering and death. That much is certain. The vegan diet is indeed a viable choice for dogs, certainly not deserving of the fear, anger, resistance and prejudice that the suggestion of it often elicits.

THE MOST COMMON CONCERN: PROTEIN

As Gillen (2003/2008) put it, “meat is not magical.” It does not contain a single essential nutrient that cannot be provided without meat. In particular, people are concerned mostly about protein requirements. Dogs require specific amounts of each essential amino acid in a day as well as adequate nitrogen. It is important to remember that every plant ingredient contains all of these essential amino acids.

There are issues that are important to pay attention to when using or understanding a sufficient and optimal vegan diet. First, not all plant based ingredients contain enough protein for a dog (if that is all you eat). For example, most fruit contains low (but still significant) amounts of protein (approximately 5% of the calories). A dog eating an entirely fruit diet would have to eat far more fruit in a day than would be convenient to consume (i.e., not efficient). That is why many vegan diets for dogs focus on higher protein and fat foods including beans such as soybeans (<http://nutritiondata.com/facts-C00001-01c20gI.html>) or bean based products such as soy protein isolate <http://nutritiondata.com/facts-B00001-01c21A0.html>, textured vegetable protein and tofu <http://nutritiondata.com/facts-B00001-01c219C.html>. Of course, plant ingredients such as oats <http://nutritiondata.com/facts-B00001-01c21U4.html> or lentils <http://www.nutritiondata.com/facts-C00001-01c217y.html> or barley <http://nutritiondata.com/facts-B00001-01c21Ta.html> or quinoa <http://www.nutritiondata.com/facts/cereal-grains-and-pasta/10352/2> for example contain significant amounts of protein as well. In fact, rice complements beans to make its amino acid profile much more efficient. Commercial kibble often uses fractioning of an ingredient to exclude some of the carbohydrate content so that they can increase the percentage of protein it provides. They often combine protein sources also in order to make it more efficient. Some cereals and grains have a good quantity of protein too. For example, see vital wheat gluten (<http://nutritiondata.com/facts-C00001-01c220o.html>) and oat bran (<http://nutritiondata.com/facts-B00001-01c21U0.html>).

Another important concept in vegan nutrition and protein is the “chemical score.”

Although each plant-based ingredient contains all of the essential amino acids, there will usually be one (or more) amino acid that, if the dog were to eat their entire protein requirement for a day and not a milligram more, they would not get enough of a particular amino acid. The one that is most limited in this regard is called the “limiting amino acid” and the chemical score is based on that. A little perspective now: first, the chemical score for most vegetable ingredients is quite high, meaning that to meet the dog’s requirement for that limiting amino acid, all they need to do is eat a bit more of that ingredient. This is rarely a problem since most dogs will eat more than the absolute bare minimum amount of total protein they require that day. It is important also to note that this same issue faces all diets and is not unique to the vegan diet. Furthermore, with a little considered ingredient combining you can improve the overall chemical score even further, making the diet more efficient. For example, soybeans have a good chemical score (118) and so does rice (74), but they do have limiting amino acids (Lysine in the case of rice), as do most protein sources. It turns out that what one is low in, the other is high in, and so when you combine them you achieve a higher overall chemical score (123).



Consider this quote from Clapper, Grieshop, Merchen, Russett and Fahey (2000) on soy as a protein source for dogs:

“The University of Illinois conducted a study comparing various sources of soy protein to poultry meal in dog diets. Diets were formulated with the following protein sources: soybean meal, soy flour, aqueous-alcohol extracted soy protein

concentrate, extruded soy protein concentrate, modified molecular weight soy protein concentrate and poultry meal. The protein sources varied in protein and fat, but the diets were formulated to be isonitrogenous and isocaloric. Nutrient intakes were similar for all diets with the exception that the dog consuming the poultry meal diet had lower intake of total dietary fiber. Ileal digestibilities of dry matter, organic matter, fat, and total dietary fiber were not significantly different, however, crude protein digestibility tended to be higher for the plant protein ingredient than poultry meal. Similar trends were observed in total tract digestibilities. Fecal weight (fresh or dry weight) was higher for the soy flour treatment and the various soy protein concentrates were similar to the poultry meal treatment. The authors concluded that soybean protein concentrates are a viable alternative to poultry meal as a protein source for premium canine diets."

Yet another variable of importance to those wishing to understand vegan nutrition is that overall, generally speaking, most plant based ingredients have a slightly lower digestibility than meat. Again, a little perspective is in order. Most common plant ingredients have a chemical score ranging from 55 to 85, while most animal sources are 70 to 80, at least for humans (Eisman, 2003). It is possible to focus on the high-end plant ingredients and do as well (or even better in some cases) than you do with animal sources. This does not mean that plant based ingredients cannot provide sufficient nutrition for the domestic dog. What it means is that plants should ideally be prepared to optimize the digestibility and bioavailability of the protein (i.e., cooking and blending to create small particle size) and sufficient quantity should be provided to make up the difference. This does not involve providing huge amounts of food. There are other studies, on the other hand, finding no difference in protein digestibility: "No differences in protein digestion of cereal-based diets containing either soybean meal or meat and bone meal as protein sources were observed in this experiment." (Huber, LaFlamme, Comer, & Anderson, 1994) Here, below is a handout written by Dr. Andrew Knight, veterinarian and creator of <http://www.vegepets.info>, on the topic.

Bioavailability

Andrew Knight BSc. (Vet. Biol.), BVMS, Cert AW, MRCVS, Veterinarian <http://www.vegepets.info/>

The bioavailability of nutrients (extent to which they are available to the tissues) is determined largely by their level of digestibility into simple molecules capable of absorption through the intestinal mucosa. The importance of digestibility is increased in animals such as cats and dogs that have relatively short intestinal tracts. Fortunately, studies have demonstrated ample digestibility of vegetarian dietary ingredients in cats and dogs.

The digestibility of some sources of protein has been evaluated in the dog. Hegsted and colleagues (1947) found that the apparent digestibility of proteins in an all-vegetable diet containing white bread, corn, rice, potatoes, lettuce, carrots, onions, tomatoes and applesauce was 80.0 (plus or minus 7.7 %). James and McCay (1950) reported that the apparent protein digestibility of commercial, dry-type food, containing both vegetable and animal proteins, ranged from 67 to 82 % for adult dogs. Kendall and Holme (1982) reported the apparent crude protein (Nx6.25) digestibility coefficients for textured soy protein, extracted soy meal, full-fat soy flour, and micronized whole soybeans ranged from 71 to 87 %. Moore and colleagues (1980) reported apparent digestibility values of soybean meal, corn, rice, and oats by mature Pointers to be in the range of 77 to 88 %. Their data revealed that normal cooking procedures did not significantly influence the digestibility of rice, oat, or corn protein. Their data also indicated that increasing the fat content of the diet from 10 to 20 % did not alter the digestibility of nitrogen in a corn-soybean-based diet. Burns and colleagues (1982) showed that the apparent digestibilities of lactalbumin, casein, soy protein, and wheat gluten are 87, 85, 78, and 77 %, respectively (National Research Council, 1986; 12).

Pencovic and Morris (1975) studied the apparent digestibility of starch (added at 35 % of diet dry matter) found in corn or wheat grain. Apparent starch digestibilities for coarsely ground, finely ground, or coarsely ground and cooked grains were: corn, 79, 94, and 88 %; and wheat, 92, 97, and 96 % respectively. It was concluded that starch from corn and wheat, especially when finely ground, is well utilized by the cat (National Research Council, 1986; 6).

Pet food manufacturers are well aware of the acceptable digestibility of plant-based ingredients, which make up a large proportion of the products, meat-based or vegetarian, that they sell.

References

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- Hegsted *et al.* 1947. In National Research Council. Nutrient requirements of cats. Washington, DC: National Academy Press, 1986:12.
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Take Home Message

The most prominent arguments people put forth against providing a vegan diet to dogs is that it is unnatural or that it is simply not nutritious enough for them. Natural is irrelevant. What these arguers are feeding is not “natural” either and even if it was, “natural” is not necessarily the best way to go. As for not being nutritious enough, the fact is that each and every single nutrient that dogs need can be provided by a plant-based diet. Care must be taken to formulate the diet well but this is always the case. Many dogs have thrived on vegan diets and continue to do so. There is no reason to believe that a vegan diet is not a viable option for those who want to implement it and the evidence is ample that it is a viable option.

SPECIFIC NUTRIENTS AND ISSUES TO BE CONCERNED ABOUT

Hand, Thatcher, Remillard and Roudebush (2000) suggest that vegan diets should be carefully evaluated to avoid deficiency in these specific nutrients: arginine, lysine, methionine, tryptophan, taurine, iron, calcium, zinc, Vitamin A and some B vitamins, ensuring that sufficient quantities of each nutrient can also be achieved through appropriate supplementation for home-cooked diets. Amino acids are easily made up by choosing appropriate plant-based ingredients, combining for efficiency and by providing sufficient total protein, while vitamins and minerals can be made up through not only ingredient choice but appropriate supplementation (just as with any other diet). Below I will address each of these nutrients, identify some good sources for each, and offer a general comment in some cases. You will notice that many of the same ingredients are listed as good sources of many of these concerning nutrients. This means that making use of these few key ingredients can go a long way to meeting these challenges and relieving this concern. For example, concentrating on oats, barley, wheat germ and soy protein isolate can go a long way to meeting the dog’s nutritional requirements.

Requirements for maintenance of a 15-kg dog consuming a 1000 kcal ME/day [means kilocalories of metabolizable energy per day]. Presented in Amount/kg DM [Dry Matter, meaning the water was removed during analysis process].

Arginine: 3.5g./kg DM

Lysine: 3.5g./kg DM

Methionine: 3.3g./kg DM

Tryptophan: 1.4g./kg DM

Taurine: Not listed as essential but probably useful and maybe essential.

Iron: 30mg./kg DM

Calcium: 3g./kg DM

Zinc: 60mg./kg DM

Vitamin A: 121RE/kg DM

B-6: 1.2mg./kg DM

B-12: 28µg./kg DM

Arginine:

Oats (<http://nutritiondata.com/facts-B00001-01c21U4.html>);

Wild rice (<http://nutritiondata.com/facts-B00001-01c21Um.html>);

Barley (<http://nutritiondata.com/facts-B00001-01c21Ta.html>);

Soybeans (<http://nutritiondata.com/facts-B00001-01c20gI.html>);

Peanuts (<http://nutritiondata.com/facts-B00001-01c219j.html>).

Generally, beans are high in arginine.

Lysine:

Soy protein isolate (<http://nutritiondata.com/facts-B00001-01c219F.html>);

Soybeans (<http://nutritiondata.com/facts-B00001-01c20gI.html>);

Wheat germ (<http://nutritiondata.com/facts-B00001-01c21Ud.html>).

Generally, bean products are high in lysine.

Methionine:

Soy protein isolate (<http://nutritiondata.com/facts-B00001-01c21A0.html>);

Peanut flour (<http://nutritiondata.com/facts-B00001-01c218R.html>).

Generally, bean and bean products are high in methionine.

Tryptophan:

Soy protein isolate (<http://nutritiondata.com/facts-B00001-01c21A0.html>);

Soy flour (<http://nutritiondata.com/facts-B00001-01c218i.html>);

Peanut flour (<http://nutritiondata.com/facts-B00001-01c218R.html>).

Generally, beans and bean products are good sources of tryptophan.

Taurine:

Best achieved through appropriate supplementation. The taurine used in commercial pet foods vegan and nonvegan alike, is synthetic. It is readily available (e.g., <http://www.carnitine-aurine.com/>)

L-carnitine:

Best achieved through appropriate supplementation. It is readily available (e.g., <http://www.carnitine-aurine.com/>).

Iron:

Parsley (<http://nutritiondata.com/facts-B00001-01c20iE.html>);

Seaweed (<http://nutritiondata.com/facts-B00001-01c20ib.html>).

Iron may be supplemented.

Calcium:

Tofu (<http://nutritiondata.com/facts-B00001-01c21A3.html>);

Agar (<http://nutritiondata.com/facts-B00001-01c20iZ.html>);

Soy protein isolate (<http://nutritiondata.com/facts-B00001-01c219F.html>).

Calcium is easily supplemented where necessary.

Zinc:

Wheat germ (<http://nutritiondata.com/facts-B00001-01c21Ud.html>);

Soy protein isolate (<http://nutritiondata.com/facts-B00001-01c219F.html>);

Peanuts (<http://nutritiondata.com/facts-B00001-01c219j.html>).

Zinc should be supplemented as needed unless sufficient wheat germ is used to meet requirements. If the diet contains a large amount of soy, consider increasing supplementation of zinc.

Vitamin A:

Retinol is the animal source of vitamin A. Beta carotene is a non-animal vitamin A.

Carrots (<http://nutritiondata.com/facts-B00001-01c21un.html>);

Sweet potato (<http://nutritiondata.com/facts-B00001-01c20h1.html>);

Kale (<http://nutritiondata.com/facts-B00001-01c20di.html>);

Pumpkin (<http://nutritiondata.com/facts-B00001-01c20fy.html>).

Generally, vegetables (particularly bright yellow and orange ones) are a good source of vitamin A.

B-Vitamins:

Nutritional yeast is a source of vitamin B-12 but it should also be supplemented to prevent deficiency. Soy protein isolate can be a source of vitamin B-6 but supplementation with B-complex vitamins should be provided.

SUPER FOODS

A few particular foods deserve special mention because they are so concentrated with valuable nutrients.

Salba (<http://www.sourcesalba.com>) is hailed as the most nutritious ingredient in the world. It is actual *Salvia hispanica* and you might be familiar with it as the stuff that grows on Chea Pets. It is very high in omega 3 fatty acids and is an excellent source of fiber. It contains 6 times more calcium than milk, 3 times more iron than spinach, and 15 times more magnesium than broccoli. It also contains antioxidants. See <http://www.salba.info> and <http://www.salbausa.com> also.

Wheat germ (<http://nutritiondata.com/facts-B00001-01c21Ud.html>) is another such food. It is very low in Cholesterol and Sodium. It is also a good source of dietary fiber, protein, vitamin B6, folate, magnesium and copper, and a very good source of thiamin, phosphorus, zinc, manganese and selenium.

Soy protein isolate (<http://nutritiondata.com/facts-B00001-01c219F.html>) is a concentrated source of amino acids and a good way to supplement a wholefoods diet to increase protein content when necessary. It is very low in saturated fat and sodium and has no cholesterol. It is also a good source of riboflavin, folate and potassium, and a very good source of protein, thiamin, niacin, vitamin B6, vitamin B12, pantothenic acid, iron, phosphorus, zinc and copper.

Parsley (<http://nutritiondata.com/facts-B00001-01c20eX.html>), believe it or not, is a highly concentrated source of many nutrients. It is low in saturated fat, and has no cholesterol. It is also a good source of protein, thiamin, riboflavin, niacin, vitamin B6, pantothenic acid, phosphorus and zinc, and a very good source of dietary fiber, vitamin A, vitamin C, vitamin K, folate, calcium, iron, magnesium, potassium, copper and manganese. It is also good for breath, the original reason they garnish dishes with it in restaurants.

Blackstrap molasses (<http://nutritiondata.com/facts-B00001-01c21Ru.html>) is low in sodium, and very low in saturated fat, with no cholesterol. It is also a good source of vitamin B6 and selenium, and is a very good source of calcium, iron, magnesium, potassium, copper and manganese.

Quinoa <http://www.nutritiondata.com/facts/cereal-grains-and-pasta/10352/2> is an excellent source of highly digestible protein. It is also a good source of Magnesium and Phosphorus, and a very good source of Manganese.

URINE PH

pH is a numeric representation of how acidic or alkaline something is. The scale goes from 1 to 14, 1 being highly acidic, 14 being highly alkaline and 7 being neutral. A normal range for the pH of a dog's urine will be from 5.5 to 7 although some normal and healthy dogs will have values a little higher or lower than this. pH is important because urine consistently outside of the normal range can generate health problems, most notably crystals in the urinary system and bladder stones. Some vegan diets can tend to promote a higher pH or more alkaline urine in some dogs than is desirable. A veterinarian can measure your dog's urine for pH or you can buy pH test strips and monitor it yourself. If you find that your dog's urine pH is outside of the normal range, consult a veterinarian to determine whether this is actually a problem for your dog. There are a few things that can be done to the diet to help it promote a more acidic urine pH. A vitamin C or methionine supplement may help. An emphasis on peas and brown rice may also help. Cranberry pills may acidify urine also. It may also be that the urine is just too concentrated and using a canned diet, or moistening kibble can help dilute the urine.

Take Home Message

There are certain nutrients which we must be careful to provide in vegan diets for dogs. The good news is that there are readily available sources of them in common plant-based ingredients or supplements. A properly formulated diet will provide for these needs. If you are complementing your dogs kibble diet with some home-cooked food, you might want to consider using some of the ingredients listed above, particularly the ones listed under Super Foods as these are excellent sources of some important nutrients even in small amounts. If you are complementing a balanced and complete diet, try not to feed more than about 10% of the dog's diet that way to ensure it stays balanced and complete. If you provide a wider variety in this complement (such as say a bit of what you are eating each day) then you might be able to provide a bit more than 10% of the regular diet. The variety will help prevent imbalance.

CAUTION

Any time you limit a diet (in this case eliminating animal products) you have to be particularly careful with the diet. Furthermore, any time you choose to offer a home-prepared diet of any kind, you need to be particularly careful. Those choosing to feed a vegan diet are no exception. They must take care to ensure the diet they use is formulated to be balanced and complete and ideally has some form of feeding trials to support it. If you use a recipe formulated by a qualified nutrition consultant or veterinary nutritionist they will probably not have feeding trials or nutrient analyses performed on the diet, but they will have formulated the diet with an understanding of the requirements of the dog and variables such as chemical scores and digestibility. Usually a vitamin and mineral supplement is provided in order to ensure that micronutrients are at the appropriate quantities. In most cases, also, a little variability built into the feeding plan can help minimize the odds of a deficiency or excess. Commercial kibble has been, in most cases, subjected to the same tests as more conventional diets.

MONITORING

If a dog is being fed a home-prepared diet, no matter whether it is vegan, conventional or otherwise, the dog should probably be evaluated at least once yearly, if not twice yearly, including the analysis of blood work. Furthermore, the guardian should evaluate the dog's general condition and behavior on an ongoing basis. Fur should be full and smooth, not greasy, itchy or lost in patches. Eyes should be clear and bright. Feces should remain normal. Activity should be normal. Behavior should remain active, normal for the breed and individual. Look for abnormality in physical condition, activity, behavior and voiding. Most vegan dogs will settle into a lean condition but they should not become excessively thin. If they do, the protein content should probably be increased, and perhaps also the fat. So, look for any changes in appearance or behavior and have the dog fully evaluated by a veterinarian at least once or twice yearly. This applies to any dog on a home-prepared diet, no matter whether it is vegan or otherwise. Note changes in hunger, thirst, weight, urination, defecation, activity level and behavior.

Vegan Diets



There are generally two options in feeding a vegan diet. You can buy commercially prepared canned and kibble diets or prepare home-cooked diets from recipes, professionally formulated to be balanced and complete. I will explore each option below.

HOME-PREPARED DIETS

Preparing a home cooked vegan diet for dogs should not be taken lightly. There seem to be many recipes published, veterinary nutritionists (with good credentials) promising to

formulate diets and products promising to provide full supplementation for home-cooked meals, but not all of them are carefully formulated to be balanced and complete (including those sold to you by well credentialed nutritionists). Some are even dangerously out of balance, contrary to their promises (although I cannot name names). You must take care in choosing a diet. It is not adequate to simply choose ingredients that achieve the correct ratio of protein to carbohydrate to fat, with adequate calories in an amount that can easily be consumed in a day and then add a multivitamin and mineral supplement to it. The ingredients chosen will influence the levels of each micronutrient and so ingredient choice must ensure nothing is at dangerously high levels and that supplementation is appropriate for each nutrient. I will provide a formulated, balanced and complete recipe below. This one was very carefully formulated with great attention to detail and took many many hours. I suggest following it strictly if you use it and working in variety making up, say, 10% or less of the total daily intake. If this recipe is too burdensome, then I suggest using a commercial vegan kibble. Every day you could maybe add a few blueberries, apple, pasta, barley or other nutritious ingredients to the meal or separately. Make sure it is not much more than 10% of the diet, though, or it could throw the diet too far out of balance. I usually feed my dog a little of whatever my family eats at meals (excluding onions, raisins and chocolate etc, which are toxic for dogs).

Below is a basic diet for a healthy 30kg (65lb) dog in average condition, getting average low to moderate exercise. It can be adjusted for dogs slightly outside of this range. This diet was formulated to be balanced and complete by Susan Dillon, Dip.N.S., Dip.C.N. (<http://www.casinstitute.com/susandillon.html> / <http://www.furkidsnaturally.com/>). Susan is an excellent nutrition consultant.

A slightly smaller dog can get a bit less and a slightly larger dog can get a bit more of this basic ration but for dogs much outside of this range, the diet needs to be formulated to meet their specific needs. If you need to adjust the recipe for life-stage or life-style, I suggest having a professional canine nutrition consultant do that for you. It will be worth the fee in order to ensure it meets your dog's specific needs.

Recipe: Rice and Soybean Diet

Ingredient	Measure
White rice, medium grain cooked with salt	279 g
Soybeans, mature, cooked, boiled without salt	172 g
Sweet potato, baked without salt	100 g
Lentils, mature, cooked, boiled without salt	99 g
Oatmeal, cooked without salt	78 g
Corn oil	14 g (1tbls)
Calcium citrate (no phosphorus or Vitamin D included)*	1250 mg
Zinc**	15 mg
Methionine***	500 mg
Freeda's Children Multivitamin Chewable****	1 tablet
L-Carnitine*****	6 g
Taurine****	3 g

* 1.64 tsp of <http://www.freedavitamins.com/merchant.mvc?>

[Screen=PROD&Product_Code=014-0338&Category_Code=cat_10](http://www.freedavitamins.com/merchant.mvc?Screen=PROD&Product_Code=014-0338&Category_Code=cat_10)

** 1 tablet of <http://www.vegetarianvitamin.com/store/catalog/Zinc-15-mg-113.html>

*** 1 capsule <http://organicpharmacy.org/products/L-Methionine/SKU:70610-argN>

**** <http://www.vegetarianvitamin.com/store/catalog/Children-Multivitamin-Chewable-115.html>

*****<http://www.carnitine-aurine.com>

Information	Measure
Serving size	742g
Kcal per serving	1040
Moisture content	69%
Caloric ratio	
• Carbohydrates	58%
• Fats	26%
• Protein	16%
Total fat	31g
Total Carbohydrate	148g
Protein	48g

Mash the ingredients together and serve. Some dogs prefer a loaf or kibble texture and if that is the case, you can spread the ingredients into a baking pan and bake in a low-medium oven until it stays together, or even throw them into a bread machine.

Sometimes you may need to add a little water to improve texture in these cases. A few blended veggies and berries can be a good way to get more phytochemicals. A little Salba mixed in after the meal has cooled can also be beneficial but remember not to make these additions more than 10% of the daily ration. Avoid making batches bigger than will be consumed in about three days to keep the food fresh and nutrients intact.

Take Home Message

If you want to prepare a home-cooked diet for your dog, be careful about the recipe you use. Many are available but not so many are balanced and complete, including those that claim to be. The one provided here is carefully formulated to be balanced and complete, but it should be followed strictly and if you cannot do so, it is probably best to choose among the available commercial kibble diets since they have done the hard work for you.

SOME VEGETARIAN AND VEGAN COMMERCIAL DIETS

The other option is commercially prepared canned diet or kibble. This is the simpler solution for those who are not prepared to put the amount of work necessary into preparing a home cooked diet. Many options are available and many will be presented below.

For a list of some available brands see the Vegan Dog Nutrition Association page at:

<http://www.behavetech.com/vegandogs.html>

Some diets are soy and wheat free for dogs with allergies or sensitivities.

Here is a look at some common commercial vegetarian and vegan dog foods (at time of writing).

Evolution Diet Gourmet Pasta Dog or Gourmet Fondue Dry Kibble

Ingredients: Whole Grain Wheat Flour, or Whole Oat Groats, Corn Gluten Meal, Soybean Meal, Soybean Oil, Carrots, Dried Tomato Pomace, Dried Potato Product, Dried Molasses, Deflourinated Phosphate, Potassium Chloride, Calcium Carbonate, Salt, Nutritional Yeast, Arginine, DL-Methionine, Kelp Meal, Taurine, Garlic, Enzyme Bromelain from Pineapple Stem & Fruit, Enzyme Papain from Papaya, Dried Lactobacillus Acidophilus, Fermentation Product, Dried Bifidobacterium Bifidum fermentation product, Lysine, Choline Chloride, Zinc Oxide, Ferrous Sulfate, Vitamin A Acetate, Vitamin D2 Supplement, Vitamin E Supplement, Niacin, Ascorbic Acid, Calcium Pantothenate, Manganous Oxide, Vitamin B-12 Supplement, Thiamin Mononitrate, , Menadione Sodium Bisulfite complex, Folic acid, Riboflavin Supplement (Vitamin B-2), Inositol, Biotin, Pyridoxine Hydrochloride, Calcium Iodate, Sodium Selenite, Zinc Methionine Complex, Copper Lysine Complex, Manganese, Methionine Complex Arachidonic Acid, Rosemary Extract, Cobalt Glucoheptonate.

Guaranteed Analysis

Crude Protein (Minimum).....28.0%
Crude Fat (Minimum).....14.0%
Crude Fiber (Minimum).....3.5%
Moisture (Minimum).....10.0%

Evolution Diet Moist Canned Dog Food (Gourmet Entree Flavor)

Ingredients: Filtered Water Sufficient for processing, Peas, Potatoes, Brown Rice, Avocado, Carrots, Wheat Germ, Oat Groats, Dicalcium Phosphate, Soybean Oil, Nutritional Yeast, DL-Methionine, L-Taurine, Guar Gum, Sea Kelp, DL- Alpha Tocopherol Acetate (Vitamin E), Vitamin A Acetate, Ergocalciferol (Vitamin D-2), Choline Chloride, Ferrous Sulphate, Zinc Oxide, Manganese Oxide, Niacin, Calcium Pantothenate, Copper Oxide, Manganese Sulfate, Riboflavin Supplement (Vitamin B-2), Thiamine Mononitrate, Pyridoxine Hydrochloride, Folic acid, Biotin, Vitamin B-12 Supplement, Sodium Selenate, Arachidonic Acid.

Guaranteed Analysis

Crude Protein (Minimum).....8.00%
Crude Fat (Minimum).....5.00%
Crude Fiber (Minimum).....2.0%
Moisture (Minimum).....76.0%

Evolution Diet Moist Canned Dog Food (Gourmet Vegetable Stew Entree Flavor)

Ingredients: Filtered Water Sufficient for processing, Peas, Potatoes, Brown Rice, Carrots, Wheat Germ, Oat Groats, Dicalcium Phosphate, Soybean Oil, Nutritional Yeast, DL-Methionine, L-Taurine, Guar Gum, Sea Kelp, DL-Alpha Tocopherol Acetate (Vitamin E), Vitamin A Acetate, Ergocalciferol (Vitamin D-2), Choline Chloride, Ferrous Sulphate, Zinc Oxide, Manganese Oxide Niacin, Calcium Pantothenate Copper Oxide Manganese Sulfate, Riboflavin Supplement (Vitamin B-2), Thiamine Mononitrate, Pyridoxine Hydrochloride, Folic acid, Biotin, Vitamin B-12 Supplement, Sodium Selenate, Arachidonic Acid.

Guaranteed Analysis

Crude Protein (Minimum).....8.00%
Crude Fat (Minimum).....5.00%
Crude Fiber (Minimum).....2.0%
Moisture (Minimum).....76.0%

Natural Balance Vegetarian Formula For Dogs

Ingredients: Ground Brown Rice, Oatmeal, Pearled Barley, Potato Protein, Canola Oil, Carrots, Dicalcium Phosphate, Calcium Carbonate, Peas, Natural Vegetable Flavor, Tomato Pomace, Flaxseed Meal, Rosemary Extract, Choline Chloride, Potassium Chloride, Parsley Flakes, Dried Kelp, Sodium Chloride, Yucca Schidigera Extract, Lecithin, Yeast Culture, Garlic Powder, Lactobacillus acidophilus, Zinc Protein, Ferrous Sulfate, vitamin E Supplement, Vitamin B-12 Supplement, Ascorbic Acid (Vitamin C), Taurine, L-Lysine, Manganese Sulfate, Niacin, Riboflavin (vitamin B-2), Copper Protein, Copper Sulfate, d-Calcium Pantothenate, Vitamin A Acetate, Inositol, Folic Acid, Pyridoxine Hydrochloride (Vitamin B-6), Thiamin Mononitrate (Vitamin B-1), Vitamin D-2, Biotin, Ethylenediamine Dihydriodide (source of Iodine), Cobalt Sulfate, Vitamin K Supplement, Sodium Selenite.

Guaranteed Analysis

Crude Protein 18%
Crude Fat 8%
Crude Fiber 4%
Moisture 10%
Omega 3 Fatty Acids 0.5%
Omega 5 Fatty Acids 3%

Natural Life Vegetarian

Ingredients: Ground Brown Rice, Ground Yellow Corn, Full-Fat Soybeans, Oatmeal, Ground Whole Wheat, Corn Gluten Meal, Linseed Meal, Vegetable Oil (preserved with natural mixed tocopherols, citric acid, rosemary extract and ascorbyl palmitate - a Vitamin C ester), Dicalcium Phosphate, Calcium Carbonate, Brewer's Dried Yeast, Garlic, Salt, Potassium Chloride, Dried Kelp, Choline Chloride, Natural Antioxidants, Yucca Schidigera Extract, Vitamin Supplements (E, A, B2, B12, D2), Niacin, Calcium Ascorbate, Calcium Pantothenate, Thiamine Mononitrate, Pyridoxine Hydrochloride, Inositol, Menadione Sodium Bisulfite Complex (source of Vitamin K activity), Folic Acid, Biotin, Zinc Proteinate, Zinc Oxide, Ferrous Sulfate, Iron Proteinate, Copper Proteinate, Copper Sulfate, Manganous Proteinate, Manganous Oxide, Cobalt Proteinate, Potassium Iodide, Sodium Selenite.

Guaranteed Analysis

Crude Protein 17.50% (min)

Crude Fat 7.50% (min)

Crude Fiber 4.0% (max)

Moisture 10.0% (max)

Ash 7.50% (max)

Calcium 1.0% (min)

Phosphorus 0.80%(min)

Copper 19.0 mg/kg

Vitamin A 13,200 IU/kg

Vitamin D 1,320 IU/kg

Vitamin E 136.0 IU/kg

*Omega 3 fatty acids 0.25% (min)

*Omega 6 fatty acids 1.50% (min)

Benevo Duo Vegan Dog and Cat Food

Ingredients: Water sufficient for processing, Potatoes, Carrots, Oat groats, Sunflower oil, Peas, Brown rice, Tomatoes, Avacadoes, Blueberries, Cranberries, Dried brewers yeast, Taurine, Vitamin A acetate, Vitamin D2 supplement, Vitamin E supplement, Ascorbic acid, Niacin supplement, D-Calcium Pantothenate, Riboflavin supplement, Thiamin mononitrate, Pyridoxine hydrochloride, Vitamin B12, supplement, Biotin, Folic acid, Zinc sulphate, Ferrous sulphate, Manganese sulphate, Copper sulphate, Calcium iodate and Sodium selenite.

Nutritional Analysis

Crude Protein (Minimum).....	8.0%
Crude Fat (Minimum).....	3.0%
Crude Fiber (Minimum).....	3%
Moisture (Minimum).....	76.0%

PetGuard Organics Adult Dry Dog Food

Ingredients: Organic Quinoa, Organic Oat Meal, Organic Ground Barley, Organic Brown Rice, Organic Dried Eggs, Organic Sunflower Oil, Organic Apples, Organic Peas, Organic Carrots, Organic Potatoes, Organic Flaxseed, Organic Amaranth, Organic Kelp, Organic Cranberries, Calcium Carbonate, Potassium Chloride, Calcium Ascorbate (Source Of Vitamin C), Choline Chloride, Vitamin A Supplement, D-Alpha Tocopherol, Calciferol (Source Of Vitamin D), Thiamine Mononitrate, Vitamin B12 Supplement, Riboflavin Supplement, Inositol, Niacin, Calcium Pantothenate, Biotin, Pyridoxine Hydrochloride (Source Of Vitamin B6), Zinc Amino Acid Chelate, Calcium Amino Acid Chelate, Iron Amino Acid Chelate, Folic Acid, Manganese Amino Acid Chelate, Copper Amino Acid Chelate, Cobalt Amino Acid Chelate, Sodium Selenite.

GUARANTEED ANALYSIS:

CRUDE PROTEIN.....	16.0% Min
CRUDE FAT.....	9.0% Min
CRUDE FIBER.....	7.0% Max
MOISTURE.....	12.0% Max
*VITAMIN C.....	500 Mg/Kg Min
VITAMIN E	250 IU/Kg Min
*FATTY ACIDS (OMEGA 3)	0.8%Min
FATTY ACIDS (OMEGA 6)	4.2% Min

v-dog Crunch Nuggets

Ingredients: Wheat, Whole Corn, Soybean Meal, Quinoa and Oats Wheat Middlings, Corn Gluten Meal, Soybean Oil, Beet Pulp, Pasta, Rice, Peas, Dicalcium Phosphate, Brewers Yeast, Whole Linseed, Salt, Calcium Carbonate, Fructooligosaccharides, Rosemary, Parsley, Mineral Supplement (Iron sulfate, Zinc Oxide, Manganese Oxide, Copper Sulfate, Calcium Iodate, Cobalt Carbonate, Sodium Selenite), Choline Chloride, Vitamin Supplement (Vitamin E supplement, Vitamin A Acetate, Niacin, Vitamin B12 supplement, Biotin, Calcium Pantothenate, Riboflavin, Vitamin D2 supplement, Folic Acid), Mixed Tocopherols

GUARANTEED ANALYSIS:

Not provided on web site.

Ami Dog Vegan Dog Kibble

Ingredients: Vegetable Protein Extracts, cereals, oils and fats, derivatives of vegetable origin, yeasts, minerals, vitamin E (natural preservative)

GUARANTEED ANALYSIS:

Moisture – 8%

Crude protein – 26.58%

Crude oils and fats – 10.44%

Crude fiber – 3.18%

Crude ash – 6.73%

Calcium – 1.29%

Phosphorus – 0.75%

Moisture – 8%

Wenaewe Vegetarian Dog

Ingredients: Organic brown rice, organic canola seed, organic flax seed meal, organic sunflower seed, organic buckwheat seed (soba), organic barley, organic millet, organic carrots, organic red beets, organic broccoli, organic high-oleic sunflower oil, organic canola oil, sea salt, organic oregano, organic garlic, ascorbic acid, propolis, vitamins (vitamins A, B12, D3, C, E, thiamine, riboflavin, pyridoxine, biotin, folic acid, pantothenate, niacin), minerals (chrome, sodium selenite, iron, cooper citrate, zinc sulfate, cobalt) [I am assured the vitamin A and D3 are synthetic]

GUARANTEED ANALYSIS:

Crude protein (Min) 20.00%

Crude fat (Min) 12.00%

Crude fiber (Max) 9.00%

Moisture (Max) 10.50%

Evanger's Vegetarian Dinner (Canned)

INGREDIENTS: WATER SUFFICIENT FOR PROCESSING, FRESH POTATOES, FRESH CARROTS, OATMEAL, SUNFLOWER OIL, PEAS, BROWN RICE, FRESH TOMATOES, FRESH AVOCADOS, FRESH BLUEBERRIES, FRESH CRANBERRIES, DRIED BREWERS YEAST, GUAR GUM, TAURINE, VITAMIN A ACETATE, VITAMIN D2 SUPPLEMENT, VITAMIN E SUPPLEMENT, ASCORBIC ACID (SOURCE OF VITAMIN C), NIA-CIN SUPPLEMENT, d-CALCIUM PANTOTHENATE, RIBOFLAVIN SUPPLEMENT, THIAMIN MONONITRATE, PYRIDOXINE HYDROCHLORIDE, VITAMIN B12 SUPPLEMENT, BIOTIN, FOLIC ACID, ZINC SULFATE, IRON SULFATE, MANGANESE SULFATE, COPPER SULFATE, CALCIUM IODATED AND SODIUM SELENITE.

GUARANTEED ANALYSIS

CRUDE PROTEIN MIN7.0%
CRUDE FIBER MAX3.0%
CRUDE FAT MIN 2.0%
MOISTURE MAX76.0%
CALCIUM MIN 0.25%
PHOSPHORUS MIN 0.20%



TAKE HOME MESSAGE

The take home message is this: dogs have specific nutrient requirements, not ingredient requirements and each and every single essential nutrient required for the domestic dog can be met without the use of meat, eggs, cheese or milk. Sufficient and optimal vegan diets can be formulated for dogs. It is not the only diet available, but it is certainly the least violent. There are certain challenges to ensure optimal nutrition for dogs on this diet, of course, and those considering implementation of this type of diet must appreciate these challenges. Luckily, they can be overcome in a properly formulated diet. I believe that I have demonstrated my thesis that a vegan diet for dogs is a viable option for those who wish to implement it.

Myth Busting at a Glance

Myth #1. Dogs are carnivores and carnivores can only thrive on a flesh-based diet. Therefore, dogs will only thrive on a flesh-based diet.

Counter-argument: This argument is excessively simplistic and irrelevant. Dogs may be anatomically and physiologically more carnivorous than rabbits, cows or even humans for example but they are less so than ferrets, cats and many other animals. The fact is that dogs can and do thrive on properly formulated plant-based diets and the reason is because each and every single essential nutrient can be provided without animal products. I'm prepared to stipulate for those whom this is important, the term "carnivore" but it is simply irrelevant.

Myth #2. Plant ingredients are not digestible or bioavailable enough for dogs to get the nutrients they need.

Counter-argument: Indeed, overall, plant ingredients are slightly less digestible and bioavailable for dogs than meat products, but there is a very wide range in digestibility in plant ingredients. Most of the less digestible ones are simply not used in dog foods and if we remove these from consideration, then the digestibility is approximately equivalent. The Huber and colleagues (1994) study demonstrated this clearly.

Myth #3. There is not enough protein in plant-based ingredients for dogs and therefore dogs should be fed a meat-based diet.

Counter-argument: Some plant based ingredients have much less crude protein than meat-based ingredients. Some have more than adequate amounts though. We tend to use the high protein plant ingredients for dog foods and there is definitely enough protein in

these for dogs. Where more protein is needed, it is a simple matter to include a protein isolate powder or simply a higher ratio of the higher protein ingredients to lower protein ingredients to bring that figure up.

Myth #4. A plant based diet is unnatural and a natural diet is preferable. Therefore, a dog should not eat a plant-based diet.

Counter-argument: What is “natural” for a domestic dog? Their distant evolutionary past would make them natural scavengers and hence they would have been consuming a mixed, omnivorous diet. Natural is not to be equated with ideal or optimal. Certainly what most people feed their dogs is not natural, and those feeding whole carcass rodents and rabbits are taking some very serious risks (see O’Heare, 2005 <http://www.behavetech.com/raw.html>). The fact is that this is a [red herring](#). That is, it is irrelevant. The important facts are what specific nutrients a dog requires, how much of each it requires and how to meet those requirements, and this can be achieved with a plant-based diet as well as a meat-based diet.

Myth #5. Vegan diets are too high in carbohydrate and too low in protein.

Counter-argument: Vegan diets can be formulated to have low or high protein content. Being vegan does not necessarily mean we cannot achieve appropriate protein content.

Resources

<http://www.behavetech.com/vegandogs.html>

<http://www.vegepets.info>

<http://nutritiondata.com>

<http://www.nal.usda.gov/fnic/foodcomp/search/>

http://www.soymeal.org/worldlit_companion.html

http://www.soymeal.org/worldlit_bioavailability.html

<http://www.soymeal.org/pdf/domesticpets.pdf>

<http://www.vegancats.com/>



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