



Plant-Based Nutrition for Dogs



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Preface

Selecting which food to feed your precious pup is an extremely difficult choice as we are overloaded with options and seemingly everyone says their food or style of diet is the best option. Like most vets, I was once just a pet parent—doing my best to care for my dogs, and making sure I did all I could for them to be with me as long as possible. While still in college at Brown University, I remember feeling extremely overwhelmed when it came to what food to feed my two Yorkies, Prince and Nahla. I wanted to make sure they were getting the best food out there, but like most pet parents, I had no idea what that was.

Starting veterinary school at the University of Pennsylvania, I was confident that soon I would know the best food options to feed my dogs and to recommend for my future patients. Early on, I discovered the perils of raw feeding, the dangers of grain-free, and why home cooking was not necessarily a good choice. I remember learning about the type of “meat” (if you could call it that) that went into pet food and being grossed out. But it seemed as though meat-based kibble diets were being touted as the only “good” option. I was disillusioned in learning that words such as “premium” and “holistic” had no legal definition as it turned out they were essentially just marketing tactics.

After graduation, I felt a sense of disappointment because I still wasn't convinced the food I was feeding my dogs was the best option. While nutrition basics are covered in vet school, the more practical approach to evaluating a pet food is not generally a part of the curriculum. It is instead provided via lunch talks sponsored by large pet food companies. Yes, I was feeding a nutritionally complete and balanced dog food from one of those large companies, and my dogs had no issues (yet)—but the ingredients list contained “byproduct meal,” none of the remaining ingredients seemed particularly great, and although the company spoke about the importance of feeding trials, this particular food did not have one.

Following vet school, I began working in general practice where I was asked countless times by my clients what food they should be feeding. As long as the pet had no health issues or known food allergies, I always gave my standard answer. I had become so comfortable with those big name brands, that I felt at a loss for how to evaluate other diets. I was very busy, and there was never enough time for my own lunch, let alone to learn more about pet food. It

wasn't long until I realized that this answer did not satisfy me, so I would need to find a better solution for my clients.

But life got busier, I became a mom, and soon we were faced with a global pandemic. In response to the lack of access to veterinary care during the pandemic, I created an affordable, multilingual telehealth platform. I wanted to make veterinarians more accessible and provide a reliable source of information to support pet parents. Once in-person care returned, I received my veterinary medical acupuncture certification in an effort to explore how alternative pain management can improve the human-animal bond.

As it happens, the bond I had with my own dog would be the one to bring me back to nutrition. My Nahla was diagnosed with tracheobronchomalacia and inflammatory bowel disease shortly after the birth of my son. Although I was a vet, I was crippled by fear, sadness, and thoughts of how we would manage her disease when I left the veterinary hospital that day. For inflammatory bowel disease, nutrition is a key component of disease management along with medications. We did all we could and were able to keep her with us for another year and a half.

What we feed our dogs directly impacts their health. Food plays a significant role in defining the composition of the gastrointestinal microbiome as well as the gut-associated lymphoid tissue (GALT) cell composition in the digestive tract- both of which greatly influence overall health. In fact, diet is a principal risk factor of chronic inflammation in both dogs and humans. Dysbiosis (an imbalance between the types of organisms present in an animal's natural microflora) creates inflammation of the GALT, which allows for antigens to enter the bloodstream and results in chronic cellular inflammation. Chronic inflammation leads to the production of free radicals which can damage and destroy tissues and can lead to inflammatory diseases such as cancer, inflammatory bowel disease, and allergies. Therefore, pet parents play a large role in disease prevention and health maintenance through the food they choose to feed their dogs (Arrazuria et al., 2017; Dodds, 2016; Li et al., 2016; Dodds & Callewaert, 2016).

A day will never pass that I do not think of Nahla, and wish that I knew then what I know now. Because of her, I continued to realize the impact of diet on health and chronic disease. This is what led me to pursue my current position as the veterinarian at Wild Earth, a plant-based dog food company. Wild Earth makes dog food, treats, and supplements without the use of any animal products. Our mission is to provide dogs with the nutrition they need

to live their best lives, without having to harm any other animals or our planet to do so.

Before beginning my current role, I was a bit skeptical (well very skeptical, if I am being honest) about plant-based diets for dogs, as many veterinarians are. This is largely because in the past owners were formulating their own homemade plant-based diets, which were often nutritionally deficient. Times have changed though, and those seeking plant-based diets are now more likely to feed properly formulated commercial diets. I have worked tirelessly to gain expertise in canine nutrition through certifications and coursework, have spoken to leading experts in the field, and have come to see the many benefits of a plant-based diet for dogs, such as longevity and food allergy symptom relief.

Since I know (all too well) that there is not much time between patients for many veterinarians to do research on alternative diets, and because the internet is full of misinformation geared towards pet parents, I have also worked to compile a repository of evidence-based research that supports plant-based feeding in dogs. We must challenge ourselves to think critically, and perhaps, in doing so, we may be able to adjust our mentality based on the overwhelming weight of evidence on the side of nutritionally sound plant-based diets.

It is my mission to educate both pet parents and veterinarians alike on the importance of nutrition, and how a nutritionally complete and balanced plant-based diet can meet the nutritional needs of dogs in a sustainable and cruelty-free way. My goal in writing this book is to provide evidence-based data that supports the safety and benefits of plant-based diets for dogs. I truly believe that lifelong learning and questioning is key, and I hope to be a reliable source of information to help dogs live longer, healthier, and happier lives.

Myth Busting: *Plant-Based* Diets for Dogs

Nutrition is of the utmost importance for both health maintenance and disease prevention and management. For this reason, one of the more difficult decisions we, as pet parents, will make is what type of food to feed our dogs. After all, good health starts in the bowl, and our pets rely on us to provide them with a diet that is complete and balanced in order to optimize their long-term health and prevent disease.

Nutrition is the fifth vital assessment, and should be assessed at every vet appointment, along with temperature, pulse, respiration, and pain. Speak to your veterinarian regularly about what you feed your dog (including treats and table scraps). If your vet has questions regarding plant-based diets for dogs, I have also written a plant-based nutrition e-book for veterinarians, titled *Canine Plant-Based Nutrition*, which is available [here](#).

Walking through the aisles at a pet store or shopping online for dog food can seem overwhelming with choices ranging from conventional meat-based kibble, to raw meat, to grain-free, to plant-based. Each comes with benefits and drawbacks, but all will claim to be the best. And to complicate matters even further, marketing also plays a role, so we will see words such as “holistic” and “premium” which sadly do not have a true legal definition when it pertains to pet food. The sad reality is, of the many factors that play a role in what food a person decides to feed their dog, most of them do not take proper nutrition into account. There is also an abundance of misinformation on the internet when it comes to nutrition. Thankfully, the truth is that if the food you are feeding is nutritionally complete and balanced, chances are your dog will do just fine. But as we all know, each dog is an individual, and different foods may be better for different dogs.

The terms natural, organic, and human-grade are defined by AAFCO and the USDA. Terms such as ancestral/paleo/keto, premium, ultra, and holistic are industry-created terms, which means they have no true meaning and are used for marketing purposes.

Traditionally, the most common diet choice has been meat-based kibble, and many people still believe that this is the “best” option. We will dive into how meat-based kibble came to be later, but ultimately humans believe that dogs should eat meat because they evolved from wolves. What people have failed to realize is that just because dogs have evolved from wolves, doesn’t mean they are wolves. This is just one of the many myths surrounding plant-based diets for dogs. I will get into each of them in more detail throughout this book, but will introduce many of them here.

Myth #1: Dogs are carnivores

While dogs do belong to the Order Carnivora, they are not classified as carnivores. Fun fact: Pandas also belong to the Order Carnivora—and we certainly know that pandas only eat plants.

Dogs diverged from wolves over 15,000 years ago (that’s a long time ago!), and evolved alongside humans, eating their scraps which included grains, fruits, and vegetables. During domestication, dogs gained many copies of the gene responsible for starch digestion, just as humans did during the agricultural revolution. This makes dogs more accurately classified as omnivores rather than carnivores. What does this mean? Dogs can obtain nutrients from both plant and animal matter, and therefore they can thrive on a plant-based or meat-based diet.

Myth #2: Dogs need protein from meat

Dogs don’t need to eat meat, but they do need high quality protein. And you know what’s loaded with protein? Plants and fungi. The truth is, that the digestive system of a dog doesn’t care where the protein comes from — it matters that the protein is high quality – meaning it is complete, highly digestible, and bioavailable. We need to see beyond the misinformation that puts meat on a pedestal as the only appropriate source of protein.

Protein-rich plant-based ingredients, such as yeast, have been shown to be appropriate protein sources for dogs, and reportedly have digestibility similar to animal-derived ingredients (Dodd et al., 2018; Reilly, 2021; Clapper et al. 2001). The reality is that there are many high quality non-animal sources of protein—one great example is dried yeast. In fact, dried yeast contains 49% protein by weight compared to 24% in beef. It’s also incredibly sustainable as

yeast can grow in just 3 days, and requires far fewer resources to produce than any animal-based protein.

Myth #3: Plant-based diets are higher in carbohydrates and lower in protein than meat-based kibble diets

Plant-based isn't synonymous with carbohydrates as we may think, as protein not only comes from meat, but also comes from plants and fungi. In fact, most commercial dry dog foods typically contain a high proportion of plant ingredients, as a high grain content is necessary for successful extrusion. It is only a small step from some of the popular meat-based dry dog foods to one that contains no meat at all.

The reality is that a commercially produced plant-based kibble can have less carbohydrates and more protein than a meat-based kibble diet. In order to illustrate this point, I compared three plant-based kibble dog foods to five popular and/or veterinarian-recommended meat-based kibble dog foods. I made sure to include a prescription hydrolyzed protein diet commonly prescribed for food-allergic dogs. Wild Earth Performance Formula dog food contains more protein and less carbohydrates than many of the leading vet-recommended dog food brands as shown below on a dry matter basis.

	Protein (DM)	Fat (DM)	Carbo- hydrates (DM)	Fiber (DM)	First Ingredient	Nutritional Adequacy Statement
Wild Earth Performance Formula (Adult)	31.1%	12.2%	43.3%	5.6%	Dried yeast	Formulated
Hill's® Science Diet® Chicken & Barley (Adult)	23.9%	14.7%	53.9%	2.1%	Chicken	Formulated
Purina® Pro Plan® Complete Essentials (Adult)	29.5%	18.2%	40.9%	3.4%	Chicken	Feeding trial
Royal Canin® Medium (Adult)	25.5%	13.3%	53%	3.6%	Brewers rice	Formulated
Royal Canin® Hydrolyzed Protein (Adult)	21.6%	19.4%	52%	3.4%	Brewers rice	Formulated
Blue Buffalo Life Protection Formula (Adult)	26.6%	15.6%	44.4%	5.6%	De-boned chicken	Formulated
Purina® Pro Plan® HA Vegetarian (Adult)	20%	8.9%	58.9%	4.4%	Corn starch	Formulated
Vdog Kind Kibble (Adult)	26.7%	10%	50%	5.6%	Dried peas	Formulated

All values are in dry matter. If ash content was not included in guaranteed analysis then the estimation of 7% was used.

Myth #4: A plant-based diet cannot be as nutritionally sound or as palatable as a meat-based diet

Plant-based diets for dogs can be nutritionally complete and balanced, they just need to be carefully formulated. If formulated correctly, they can not only meet but exceed AAFCO nutritional guidelines. Currently, we evaluate meat-based diets based upon whether they meet these guidelines, and the same method should be used to evaluate plant-based diets.

A 2021 study examined the steps taken to ensure the nutritional soundness and quality of plant-based pet foods and found that plant-based diets were produced at equal or superior standards to meat-based diets, with acceptable or superior standards overall at all stages of formulation (Knight & Light, 2021). Not only can commercially available plant-based diets be of high quality and be healthy, but they can also be delicious and satisfying to dogs. In 2021, a group of researchers from the University of Winchester surveyed the owners of 2,308 dogs (and 1,135 cats), and found that those who were fed plant-based diets for at least one year were just as eager to eat and just as healthy as those fed meat-based diets (Knight & Satchell, 2021).

A plant-based diet for dogs can be balanced and nutritious, help dogs live healthier and longer lives, and be a diet that dogs love! This is not to say that all plant-based diets are created equal, and careful evaluation of the diet must be completed.

Myth #5: A dog's health will decline on a plant-based diet

More studies are being published that show plant-based food can be healthier for some dogs than conventional diets, and promote longevity. The most recent, comprehensive, and first long-term study was published in 2023. Fifteen clinically healthy client-owned dogs were fed a complete and balanced plant-based diet for a year, and the authors concluded that health was maintained (Linde et al., 2023).

Prior to this groundbreaking study, the authors of a short-term study published in 2021 came to a similar conclusion. Researchers evaluated the short-term amino acid, clinicopathologic, and echocardiographic findings in thirty healthy dogs fed a commercial plant-based diet for 12 weeks, and concluded that the health of the dogs was maintained and did not deteriorate (Cavanaugh et al., 2021). Another study, where sprint-racing sled dogs were fed a nutritionally complete and balanced vegan diet, demonstrated that a carefully balanced meat-free diet can maintain normal hematological values in exercising dogs (Brown et al, 2009). These studies, and many more, will be detailed later in “Why Choose A Plant-Based Diet?”

Still, one may ask, why choose plant-based over meat-based?

Plant-based diets for dogs are not only nutritionally sound, but a recent study conducted by Andrew Knight, a veterinarian, found that “the pooled ev-

idence to date indicates that the healthiest and least hazardous dietary choices for dogs are nutritionally sound vegan diets” when compared to conventional meat-based kibble and raw meat diets. There are many possible reasons for this conclusion. The first is that the most common culprits involved in cutaneous adverse food reactions in dogs are beef, dairy and chicken (Mueller et al, 2016). Plant-based diets are inherently devoid of these ingredients, and therefore often offer symptom relief to those dogs with food allergies.

Also important to note, the meat used in pet food is traditionally low-quality meat that is unfit for human consumption. That means “meat” by the broadest definition, that can come from dead, dying, diseased and downed animals. Well, what about meat-based fresh pet food? While it is likely to be a healthier food choice than meat-based kibble with higher digestibility, it can be prone to bacterial contamination, and it means that more animals are being slaughtered for our pets to eat. Why? Remember—much of what goes into traditional pet food is from those parts of the animal that are not fit for human consumption.

The Association of American Feed Control Officials (AAFCO) is in the process of developing an official definition for human-grade foods, and this is expected to be published some time in 2023 after undergoing AAFCO’s formal approval process. If a pet food company claims that they are selling “human-grade” dog food at this time, the food does not have to meet any legal requirements.

Aside from animal welfare concerns, this has a huge impact on our planet. According to a University of California Los Angeles (UCLA) study published in 2017, meat used for pet food accounts for 25–30% of meat consumed in the United States (Okin, 2017). This roughly creates about 64 million metric tons of greenhouse gas emissions per year, which is equivalent to the annual exhaust produced by 14 million cars. These numbers will only increase as the number of pets increases and more “human-grade” meat products (with actual regulation) hit the market.

If dogs and cats in the United States were their own nation, they would rank 5th in meat consumption (Okin, 2017).

We now know that dogs are omnivores and do not require meat, the meat in pet food should at the very least be questioned, and that meat consumption

by pets is a huge contributor to greenhouse gas emissions, which are contributing to the decline of our planet.

Plant-based food offers a healthy, sustainable option that has been shown to lead to positive health outcomes in humans as well as dogs. For humans, multiple studies have linked plant-based diets to a lower body mass index (BMI), improved insulin resistance, reduced risk of cardiovascular disease and improved cardiac function, reduced risk of coronary disease and decreased incidence of hypertension (Clem & Barthel, 2021). Furthermore, studies also suggest that plant-based diets may decrease modifiable risk factors for certain cancers as processed meats have been shown to increase the risk of developing cancer (Farvid et al., 2021). For dogs, research continues to emerge. The most recent studies, which are explored later in “Why Choose A Plant-Based Diet?”, suggest that dogs fed a complete and balanced plant-based diet may require less vet visits and live longer than those fed commercial meat-based kibble diets.

As pet parents, it is our duty to feed our dogs what is best for them. Later, I will discuss the science that supports plant-based diets for dogs as well as situations where it may even be preferable to a conventional meat-based diet. Plant-based dog food introduces an option for veterinarians and pet parents alike that can potentially help with symptoms caused by food allergies, improve overall health and longevity, support environmental sustainability and improve animal welfare on a large scale. These diets can be nutritionally complete and balanced, they just need to be carefully formulated. In the next chapter, I will address each of the nutrients that dogs need, and later will dive into how those needs can be met by a nutritionally complete and balanced plant-based diet.

Veterinarians have rightfully been very skeptical of alternative diets, including plant-based diets for dogs, because many past studies found that historically these were nutritionally deficient. The reason for this was that most people were formulating their own plant-based diets at home, and these, of course, were not nutritionally complete and balanced. In the last several years, however, there has been an explosion in evidence-based research that supports plant-based feeding of dogs, and now we have many commercial companies manufacturing these foods on an industrial level, and most of them are taking good steps to ensure that products meet a high standard and are nutritionally complete and balanced.

Dogs Need *Nutrients*, Not *Ingredients*

“Dogs have dietary requirements for energy and essential nutrients, but they do not have a recognized requirement for animal-derived ingredients per se” (Dodd et al., 2018).

Dogs eat to acquire nutrients. Nutrients are compounds in food that the body uses for normal growth, maintenance, and repair, and they are either essential or non-essential. Essential nutrients are those that the body does not produce in sufficient quantities to meet the body’s demands, and therefore they must be obtained from the diet.

The six nutrient classifications are:

🏠 Water	■ Protein
■ Fat	● Carbohydrates
⌘ Vitamins	☼ Minerals

Only three of these nutrients are energy-producing, meaning they contribute to the calorie content and provide the body with energy. Those are protein, carbohydrates, and fat. Why do dogs need energy? Ultimately all living organisms require energy for all bodily functions, and the amount of food an animal consumes is guided by the amount of energy they require. Feeding recommendations for each specific dog food will be based primarily on making sure a dog is receiving the appropriate amount of calories, or energy, and all remaining nutrients should be balanced relative to the energy density to make sure your pet is receiving the appropriate amount of all nutrients.

So yes, dogs eat to acquire nutrients (and energy). It is the ingredients that deliver these nutrients. Ingredient selection is of utmost importance when formulating a dog food, as ingredients are essentially nutrient vessels, and many work to provide a variety of nutrients. For example, the yeast I mentioned earlier not only provides protein, but also provides fiber and B vitamins to the diet, which are important for digestive health and cell function respectively.

This brings me to the term “complete and balanced”—what does it mean? To answer this question, I first need to introduce The Association of American

Feed Control Officials (AAFCO). AAFCO is an organization made up of federal and state regulatory officials that has established nutritional requirements, guidelines for standard ingredient definitions and product labels, and feeding trial protocols for pet foods. However, AAFCO does not directly test, regulate, approve or certify pet foods to make sure that they meet these standard requirements. Instead, pet foods are regulated at the state level. Most states follow AAFCO model regulations, however interpretation may differ between states.






AAFCO guidelines for pet food labels include the nutritional adequacy statement (aka the complete and balanced statement), which explains whether the food contains essential nutrients, how that was determined, and for which life stage the food is appropriate for. Essentially, this statement lets the consumer know if the food is “complete and balanced” for a particular life stage. For a dog food company to claim that their food is “complete and balanced” for a specific life stage, they must validate the claim either by nutrient content analysis or AAFCO compliant feeding trials. The nutrient content can be determined either from testing a sample of the finished diet, or by using the nutrient content of the individual ingredients in the food to calculate the diet composition. The former is preferred as ingredients are inherently variable in nutrient content because interactions with other nutrients and processing can alter bioavailability in the finished product. Although companies do not typically provide this information, you may contact the company to inquire about testing done on the finished product, quality control measures and the qualifications of the individual(s) formulating the diet.

At Wild Earth we test our finished products to ensure they not only meet, but exceed, AAFCO nutritional requirements for adult maintenance.

To make sure that a dog is receiving the appropriate amount of nutrients from their food, it is important they be fed a diet for their specific life stage—adult maintenance or growth and reproduction. Puppies, pregnant, and nursing dogs should be fed a food formulated for “growth and reproduction.” Dog food formulated “for all life stages” is formulated to meet the nutrient requirements for growth and reproduction, which are different from non-reproducing adult dogs. In comparison with maintenance requirements for adult dogs, puppies require a more calorically dense food with higher concentrations of fat, protein, and essential minerals. Large and giant breed puppies have even more specific needs, especially with regard to calcium. AAFCO guidelines

now require pet foods that are categorized for growth to specify if they have met additional guidelines for puppies expected to be more than 70 pounds at their mature adult weight.

The age at which a puppy becomes an adult depends on breed size.

When Dogs Age to Adults	 Extra small	 Small	 Medium	 Large	 Extra large
Weight	<10 lbs	10-25 lbs	26-55 lbs	56-100 lbs	101 lbs+
Age	8 months	10 months	12 months	15 months	18-24 months

AAFCO has no official guidelines for senior pet nutrient levels, and therefore feeding senior diets is controversial as those products differ dramatically between companies. Seniors should be fed based on their individual needs, and senior products should be evaluated based on whether they meet those needs.

Senior dogs who have healthy kidney and liver function generally require higher protein levels in order to maintain optimal lean body mass.

If you have an adult dog, choose a food formulated for adult maintenance—this is especially important to avoid health issues such as obesity. If you have a puppy, or a pregnant or lactating dog, it is important to choose a food formulated for growth and reproduction (aka a “puppy” food) as they require more calories, calcium, and protein than adult dogs. Some puppy foods are even formulated with large breed puppies in mind as they also have different nutritional requirements. If you have a question on what food is best for your dog, always consult a veterinarian or a veterinary nutritionist.

Feeding guidelines, or how much to feed, are located on each bag of dog food and will be different for every food as calorie content per cup will differ. Refer to these guidelines when determining how much to feed your dog, and remember puppies grow rapidly so you will need to adjust the amount of

food fed frequently. As mentioned, feeding recommendations for each specific dog food will be based primarily on making sure your pet is receiving the appropriate amount of calories, or energy, and all remaining nutrients should be balanced relative to the energy density to make sure your dog is receiving the appropriate amount of all nutrients. Age, activity, gender, spay/neuter status, breed, and even disease can influence energy requirements. For example, spayed and neutered dogs have a lower energy requirement than intact dogs.

Use the feeding guidelines only as a guide. Every dog is an individual, and therefore assessing your dog's body condition is important. You want to make sure your dog's body condition is in the ideal range (a 5 in the chart below), meaning their ribs are easily palpable, you can see their waist, and they have an abdominal tuck.

Body Condition Score Guidelines:

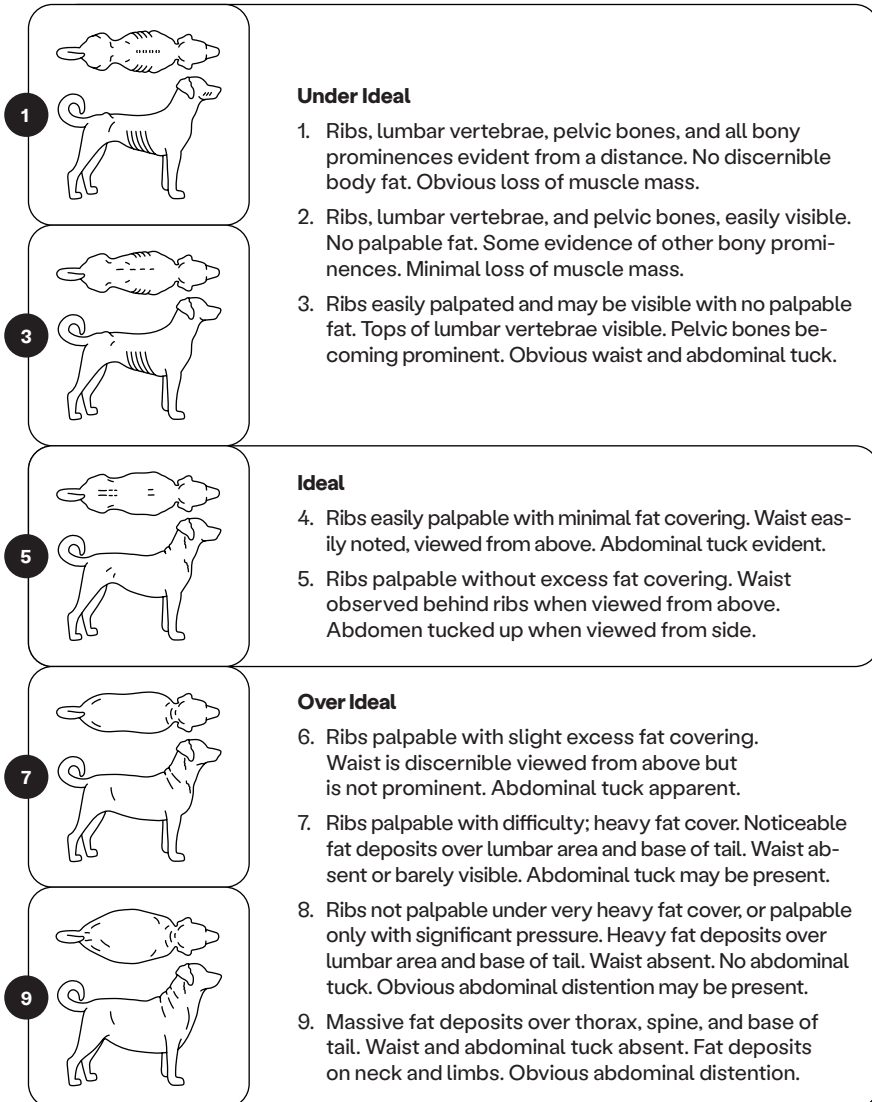


Figure A: Body Condition Score. World Small Animal Veterinary Association, 2013

Obesity is a growing problem for humans and dogs alike, and in North America, obesity is the most common preventable disease in dogs. The Association for Pet Obesity Prevention reports that more than 50% of dogs are overweight. Not only are overweight pets predisposed to a variety of chronic health issues such as joint disease, respiratory disease, and certain types of

cancer, but they are also found to live on average 2.5 years less than dogs of ideal body weight (Salt et al., 2019). For dogs, this equates to about 18% of their lifespan. While plant-based diets have not been clinically studied for weight loss in dogs, they have been studied in humans, and have been shown to be associated with a decreased BMI and decreased visceral fat.



**Treats should only make up
10% of a dog's daily calorie intake!**

All in all, the ingredients in dog food are used as vessels to deliver the nutrients that dogs need. After all, the body needs nutrients, not ingredients. Choosing high quality ingredients is of utmost importance because ingredients must be digestible—meaning they need to be able to be broken down for the body to acquire the nutrients contained in them—and the nutrients must be bioavailable, or able to be used by the body. Always make sure to critically evaluate the ingredient list.

Unfortunately, there is no way to easily determine the ‘quality’ of a product or identify the pet foods that have undergone more rigorous testing by simply looking at the bag. For this reason, the World Small Animal Veterinary Association (WSAVA) Global Nutrition Committee created guidelines on selecting pet food to help pet parents and veterinarians better assess diets. Furthermore, the Pet Nutrition Alliance Dare to Ask website is a wonderful resource as they have contacted all 227 pet food manufacturers, asked a subset of WSAVA criteria questions, and posted their answers.

Later in this book, we will take a closer look at each of the essential nutrients for dogs. But first, let's dive into the domestication of dogs.

Calculating Dry Matter (DM)

You will see the term dry matter (DM) used throughout this book. Dry matter removes the moisture content from the food in order to more accurately compare the nutrient profiles of foods that have different moisture contents.

Nutrient dry matter % = % nutrient as fed basis / (100% - moisture content %)

Your Dog Isn't a Wolf, Don't *Feed Them* Like One

Marketing has always played a role in what consumers believe to be the “best,” and this continues to be true today. Why do consumers (and interestingly enough, a lot of vets) think a dog is basically a wolf and needs to eat meat? Could it be from dog food commercials focused on wolves running and turning into dogs? Or marketing tactics making you believe the best dog food needs to have meat listed as the first ingredient? Or maybe it's from the new wave of raw diets which claim “ancestral feeding” (except that modern dogs' digestive systems are very different from their ancestors, and ironically it was us humans that helped change them). Wherever you've heard this before, I hope to shed some light on dog domestication and the unique nutritional needs of modern dogs.

Yes, dogs evolved from wolves, but the key word is evolved. A modern dog is not a wolf and should not be fed like one. Dogs descended from a population of wolves that are thought to have gone extinct towards the end of the Ice Age. The divergence of dogs took place as early as 40,000 years ago, with evidence of the first actual domesticated dogs found in human campsites occurring around 15,000 years ago. Since that time, there has been one other domestication event occurring in Asia, and that was about 12,000 years ago. Keep in mind that these are ballpark timeframes and a lot is still unknown.

So how did dog domestication occur? Ancient gray wolves and ancient humans both had similar family group structures, where communication and cooperation were important. This is thought to be the foundation for why they were able to evolve together. They lived near each other for thousands of years and would cross paths as they hunted some of the same animals. Most wolves were actually afraid of people and those are the ones that evolved to become today's modern wolves. At that time humans lived in hunter-gatherer societies, and the wolves that were less fearful, ventured closer to humans, eating the food scraps and waste near their human settlements. Humans, in turn, benefited from the protection these select wolves provided.

With a regular food source, these friendlier wolves flourished and had many offspring. They passed on their behavioral characteristics, namely that friendliness, to their offspring. As they evolved, they became smaller and much less aggressive. Other traits that accompanied friendliness included: their teeth became smaller, their snouts shortened, and they developed curly tails and floppy ears.

As humans shifted from hunter-gatherers to ones dominated by agriculture, starch became a larger part of their diet, and in turn, they had to become better at digesting starch. In humans, amylase is produced in the saliva and by the pancreas, and in dogs it is solely produced by the pancreas. At the outset of the agricultural revolution, which took place sometime between 11,500 and 6,000 years ago in western Eurasia, the genes responsible for producing amylase in saliva for humans were copied many times over in response to this selective pressure.

A similar process occurred in the ancestors of dogs, although the time frame remains vague. Since they lived alongside humans, they too began consuming more starch, and duplication of a gene called AMY2B gene, which is responsible for pancreatic amylase production, occurred. Modern day dogs have developed many more copies of these genes making them functionally omnivorous and able to eat and properly digest more starchy foods.

Gray wolves only possess 2–8 copies of this gene, with 60% of wolves having only two copies. As we know they are primarily carnivorous and likely more similar to early domesticated dogs. Dogs on the other hand can have anywhere from 4–34 copies, suggesting that dogs have adapted to a starch rich diet. Interestingly, most dog breeds who were domesticated in agricultural hubs and have had the longest time to adapt to agriculture, have the most copies of this gene. Oppositely, those who were bred by indigenous peoples inhabiting arctic regions where conditions are poorly suited for agriculture have fewer copies of this gene.

Did you know?

During the Victorian era (1837-1901) they bred dogs with interesting traits until they had *hundreds of different breeds*.



Compared to true carnivores, dogs not only produce more of the enzymes needed for starch digestion, but they also have much lower protein and amino acid requirements and can more easily utilize vitamins A and D from plant sources, just as people do. All of these factors make them more accurately classified as omnivores rather than carnivores, meaning they can do well on meat or plant-based diets (Heinze, 2016).

To further illustrate this point, a group of researchers set out to compare the genome of dogs to the genome of wolves in order to further shed light on the genetic changes that accompanied the transformation of ancient wolves into domestic dogs. They found that 36 regions of the genome differ, and were likely found to represent targets for selection during dog domestication. These regions contained genes that fell into two main categories—those genes important in brain function, and likely responsible for behavior traits, and those responsible for starch digestion and fat metabolism (Axelsson et al., 2013). As we well know, the temperament of a dog is not similar to that of a wolf, and this study illustrates the genetic basis for why that is. The ability of modern dogs to thrive on a diet rich in starch, relative to the carnivorous diet of wolves, constituted a crucial step in the early domestication of dogs.

Walker and colleagues set out to demonstrate just how well dogs were able to digest starch by cannulating the terminal ileum of 9 dogs and feeding a food containing 67% extruded corn, rice, oats or barley (Walker et al., 1994). They found that starch digestion was complete, with all grains being nearly 100% digested in the small intestine. While Wild Earth does not condone research that harms animals, I felt it was important to share the relevant research.

The differences between dogs and wolves do not stop at the *AMY2B* gene copy number. Before I go into these I just want to make a quick comment that, similar to most wild animals, the diet of a wolf is meant to maintain their health through their reproductive years. For our pets, however, we are not feeding to meet basic needs—we are feeding for health and wellness. It is our goal for our dogs to maintain health past their reproductive years and live longer than wild wolves.

Aside from how well they can digest starch, dogs differ from wolves in many other ways:

	 Dogs	 Wolves
Approaches human	✓	⊘
Can respond to human gestures (ex: pointing)	✓	⊘
Body size	Smaller	Larger
Mouth	Smaller jaws and weaker molars	Larger jaws and stronger molars
Legs	Shorter	Longer
Ears	Floppy	Pointed
Eye color	Range from brown to blue	Yellow
Heat cycle	2x/year	1x/year
Birth	Anytime of year	Spring
Communication	Bark	Howl

Humans have coevolved with dogs, and a 2015 study demonstrated that when a human and dog interact, both experience an increase in oxytocin levels (Nagasawa et al, 2015). Further, dogs look to humans for help during tasks, whereas socialized wolves do not (Miklosi et al., 2003).

Now that we know that dogs differ from wolves and can digest starch with ease, let's explore whether their nutritional needs can be met, and whether they can thrive on a plant-based diet.

Dog Food Evolution and *Safety*

As we just learned, dogs have been domesticated for thousands of years, and as early as 2000 BCE humans have been giving consideration to what they feed their dogs. Prior to the Industrial Revolution, dogs were rarely fed meat. Examples of what dogs were fed are milk-soaked barley, bones, cabbage, potatoes, and crusts of bread.

In the 1800's, with the Industrial Revolution giving rise to a more affluent middle class, humans began seeing pets as companion animals instead of simply working animals. By 1850, it became common practice to buy horse meat from the working horses that would die in the streets to feed to pet cats and dogs alike in certain cities. The science of veterinary nutrition began to emerge in the late 1800s and has continued to evolve. The first commercial dog food was created in 1860 by James Spratt which was made from “a mix of wheat meals, vegetables, beetroot, and beef blood”, and was inspired by the biscuits eaten by sailors that Spratt saw being fed to dogs. In 1922, canned dog food was introduced, with the main ingredient being horse meat, and it became so popular that roughly 50,000 horses per year were slaughtered to meet the demand—which infuriated animal welfare advocates.

During World War II, tin and meat were rationed, and big names such as General Mills and the Ralston Purina Company entered the scene as the former acquired Spratt's business and the latter began experimenting with the methods used to create Chex breakfast cereal. In 1956 the first dry kibble was produced via extrusion, Purina Dog Chow, using the same methods used to produce cereal. In 1964, a group of pet food industry lobbyists (The Pet Food Institute) launched a series of very successful ad campaigns convincing consumers to feed a commercially prepared meat-based dog food. The dog food industry boomed with a focus on money, but thankfully history was able to be corrected with the introduction of governing bodies and legislation. In the mid-1980's the first nutritional requirements for dogs and cats were published in the US to ensure manufacturers were taking responsibility for their product, and since then, research has continued to ensure pet food is safe and has

a minimum level of nutrition. Using scientific research, AAFCO continues to adjust pet food standards in order to improve the pet food industry, paving the way for new ingredients to be used to offer complete and balanced meals.

What have we learned from this timeline? The two main takeaways are:

1. Humans have always shown an interest in what to feed their dogs and opinions have always varied on what is best.
2. Competitive capitalism has played a huge role in how pet food has evolved and what owners believe to be best.

For better or worse, humans have essentially controlled the evolution of canine diets and this influence is the reason they eat what they eat. Over the years, even the microbiomes of dogs have evolved to be more similar to that of humans. In a 2019 study, researchers compared the microbiomes of dogs to that of humans and wild wolves. The authors concluded that while dogs still maintained some commonalities with wolves, the gut microbiota has been “extensively shaped by artificial selection, altered diet and close contact with humans” (Alessandri et al., 2019). Even further, another study concluded that the canine gut microbiome overlaps with the human microbiome by 63%, and this overlap must be attributed to similar physiology and lifestyle rather than solely to transmission (Coelho et al., 2018).

Traditionally, the majority of pet owners feed a commercial meat-based kibble because lobbyists have worked hard to create ad campaigns touting these foods as “the best”. However, as stewards of our pet’s health, it is important to think critically about what is considered “best.”

Americans are spending more money than ever before on their beloved pets, and a large portion of this goes towards what’s in their food bowl, but what are they paying for? Traditional meat-based kibble typically contains the parts of animals that may be unfit for human consumption, ranging from organs to those animals that are down, dead, dying, and diseased (4D). While the use of “byproducts,” the non-rendered parts of the animal other than the meat, is environmentally responsible, it adds a question mark to what is actually in the food. Essentially it is often used as a method to keep protein levels high (but not always high quality), and food production costs low. The more problematic meat ingredients are those designated as “meal,” which are the result of rendering. Rendering is defined as “an industrial process of extraction by melting that converts waste animal tissue into usable materials.” In other words, it is a process by which animal parts that are often unfit for human consumption (including expired meats, the 4D meats, and even animals who have drowned after a flood) are chopped up and boiled into a stew which is then dehydrated. The fat and protein portions are then removed and used as animal fat or ground up into “meal,” respectively. To further compound the problem, if the general term “meat meal” is used, the animal the parts came

from is not disclosed. Even if a specific animal is named on the label such as “chicken,” for example, meat is often mislabeled, meaning what is on the bag isn’t necessarily what is inside. In 2015, a Chapman University research team looked at 52 commercial pet foods, and found that 40% of those tested contained mislabeled meat products (Okuma et al., 2015).

To add to concerns surrounding meat-based dog food, meat is much more likely to become contaminated with bacteria such as Salmonella. There have been over 180 dog food recalls since 2009, and major ones from bacterial contaminants from meat sources. In fact, 49% of all pet food recalls in the past ten years have been from pathogenic bacteria. The second leading cause of pet food recalls is pentobarbital, a euthanasia drug. In 2018, the director of FDA Center for Veterinary Medicine addressed this, stating “we have reason to believe rendered products can be a source for pentobarbital” (FDA.gov, 2018).

Further, meat-based pet food has not only been found to contain pentobarbital, but it has also been found to contain hormones, antibiotics, and toxic amounts of heavy metals. The Clean Label Project, a national nonprofit focused on health and transparency in labeling, tested the top pet foods and found lead in some pet foods at 16 times the concentration of lead in Flint, Michigan’s tainted drinking water. They also found arsenic in concentrations of 555 times higher than the maximum contaminant level for human drinking water set by the Environmental Protection Agency.

Ten Years of Pet Food Recalls

Total: 327,140,539 lbs

Total kibble: 66%

Total can: 32%

Total raw: 0.6%

Total other: 0.1%

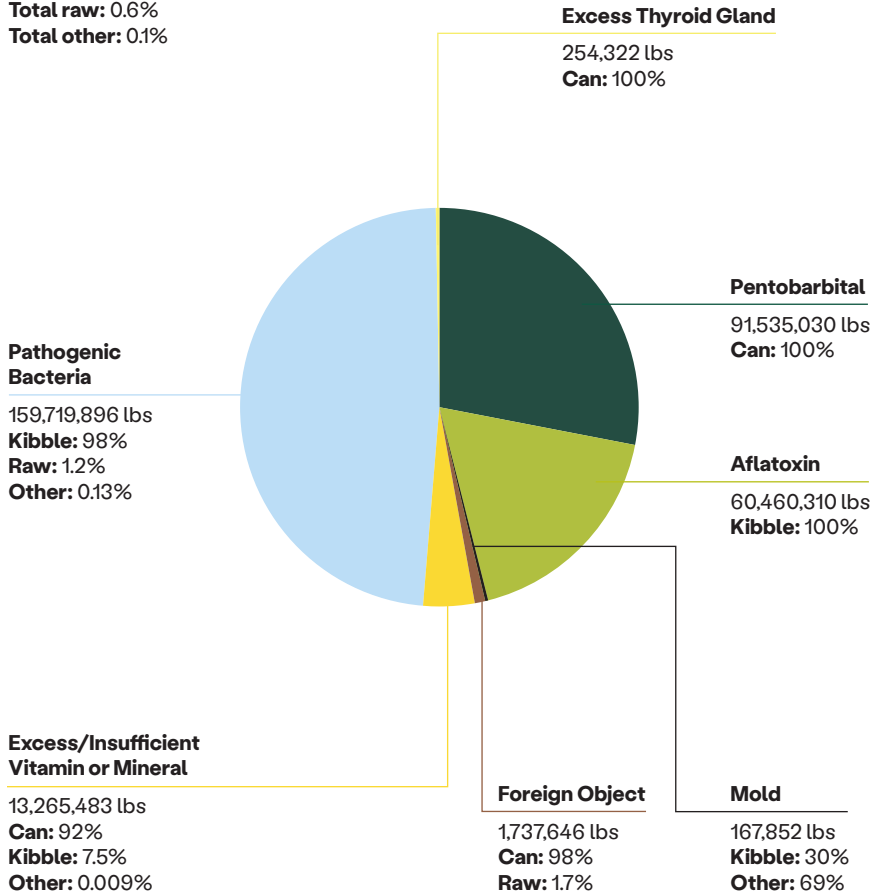


Figure B: Ten Years of Pet Food Recalls. Truthaboutpetfood.com, 2021

Protein—Yes, *Plants* have Protein

Plant-based protein can offer the same benefits as animal-based protein, without the allergens.

Proteins are made up of amino acids, which are classified as essential, non-essential, and conditionally essential. There are 20 amino acids which can come together in a wide variety of numbers and sequences to make different proteins with different functions. Dogs do NOT have a protein requirement. They have a requirement for the amino acids and nitrogen.

Essential amino acids include:

Arginine	Lysine*	Tryptophan
Histidine	Methionine*	Valine
Isoleucine	Phenylalanine	
Leucine	Threonine	

*Methionine and lysine are typically "limiting amino acids," which means they are typically provided in the lowest amount in dog food, therefore providing the limitation on protein synthesis. At Wild Earth, we choose to include these in our guaranteed analysis to demonstrate to consumers and veterinarians that we are meeting the AAFCO recommendations.

Non-essential amino acids include:

Alanine	Glutamate	Hydroxyproline
Asparagine	Glycine	Proline
Aspartate	Hydroxylysine	Serine

Conditionally essential amino acids include:

Cysteine
Glutamine
Tyrosine

Essential amino acids are those that must be obtained from the diet, whereas non-essential amino acids are those that can be made by the body. Conditionally essential amino acids are those that must come from the diet during times of stress, such as disease.

Amino acids are the building blocks of protein, and protein plays many critical roles in the body. Proteins are the main structural component of or-

gans and tissues such as muscle, function as hormones and enzymes, and provide a source of energy. What happens if dogs don't get enough of the essential amino acids to meet their requirements? Signs of protein deficiency include weight loss, dull coat, anemia, muscle loss, poor growth, increased susceptibility to disease, and even death.

Protein sources vary in level of quality. Protein quality refers to the efficiency by which amino acids from food are converted into tissue. That efficiency depends on protein source, concentration of essential amino acids in the food, and their bioavailability. Protein sources that are highly digestible and provide all 10 essential amino acids in relatively appropriate amounts are considered high-quality, or 'complete,' and this can be true for both plant and animal sources. As mentioned, studies have concluded that yeast and soy, for example, are considered appropriate alternatives to poultry meal as the main protein source in dry, extruded canine diets (Reilly et al., 2021; Clapper et al., 2001).

Yeast is considered a 'complete' protein as it contains all 10 essential amino acids dogs need. That is why yeast is the backbone of our Performance Formula and Maintenance Formula.

While it is true that many animal sources of protein are considered high quality, such as chicken and beef, this is not always the case for the meat sources used in pet food. Rendered byproduct meals commonly used in pet foods, for example, have much lower amino acid digestibility, and are therefore lower in protein quality, than raw animal meals (Cramer et al., 2007). These animal sourced ingredients, specifically chicken and beef, are also some of the most common food allergens for dogs.

Even if a protein is 'complete,' most dog food manufacturers make use of protein complementation when formulating complete and balanced diets.



What is protein complementation?

Protein complementation is the use of different protein sources with complementary amino acid profiles to create a complete amino acid profile. It is a common practice in both plant-based and meat-based dog foods. This is why you will often see plant sources of protein, such as yeast and soy, used in meat-based dog food, and why dog foods may contain more than one protein source. Generally, the higher quality the protein, the less complementation is needed.

Whether we like it or not, the reason that “meat” has become synonymous with “protein” is because of politics. The meat industry in the United States is a powerful political force, both in the legislative and regulatory arenas. Lobbying organizations such as the National Meat Association and the American Meat Institute work hard to prevent new meat-safety initiatives and improvement of animal welfare (because oftentimes that means decreased productivity). These lobbying organizations have had a long-standing relationship with The Food Safety and Inspection Service (FSIS), which is the government agency in charge of regulating the meat industry.

Furthermore, we have been conditioned to look for meat as the first ingredient, and believe this to be the true marker as to whether a dog food is “bad” or “good”. This can be misleading, however. For example, raw chicken is a quality item, but contains up to 73% water. After cooking, most of that moisture is lost, reducing the meat content to just a fraction of its original weight. Therefore, even if chicken is listed as the first ingredient, once water loss is accounted for, it would drop down on the ingredients list. The fallacy that meat must be the first ingredient on an ingredient list has also led to the common practice of ingredient splitting.



What is ingredient splitting?

Ingredient splitting is a way to artificially boost a desirable item (like meat for example) to a higher spot on the ingredient list while lowering the ranking of a less desirable ingredient. The ingredients on an ingredient list are listed in order of its precooking weight. Let's consider an example where a manufacturer creates a dog food that contains rice as the main ingredient of the recipe, and some chicken. An ingredient list would have rice listed as the first ingredient. If the manufacturer breaks rice into smaller portions of similar ingredients, however, such as white rice and brown rice, then they can fall further down on the ingredient list and chicken can then be listed as the first ingredient.

We now know that dogs do not need to eat meat, and can receive high-quality protein from plants and fungi. Below are the protein sources included in Wild Earth Performance Formula and Maintenance Formula:

Dried yeast is the backbone of our recipe because it is a great source of high quality, clean, non-animal protein that helps build and maintain muscle. In fact, dried yeast contains 49% protein by weight compared to 24% in beef. It's also incredibly sustainable as yeast can grow in just 3 days, and requires far fewer resources to produce than any animal-based protein. Not only does it contain all 10 essential amino acids dogs need, but it is high in beta-glucans and B vitamins, which are important for digestive health, and play a vital role in maintaining good health and wellbeing.

Potato protein is about 72% protein, and highly digestible. It helps support strong muscles, promotes a healthy immune system, and is a great source of vitamins and minerals.

Whether from animal or non-animal sources, the AAFCO minimum protein requirement is 18% DM for adult maintenance and 22% DM for growth and reproduction. Protein needs are higher during growth, pregnancy, lactation, or when there is tissue damage, which, again, further demonstrates the importance of choosing a dog food that is appropriate for a dog's life stage.

Carbohydrates— *Friend or Foe?*

Carbohydrates not only supply glucose, but they play several other roles in the body. While omnivores have an energy requirement, they do not have a carbohydrate requirement per se because they can also use protein and fat for energy. This is the basis for the argument many proponents of raw feeding and keto diets try to make. And this would be a valid argument if it weren't for several very important points.

First, carbohydrates, in particular simple carbohydrates and starches, are the easiest forms of energy for the body to break down. If there are not enough carbohydrates to produce the necessary glucose, amino acids will be shunted away from muscle growth, for example, to be used for glucose synthesis.

Second, and along the same vein, the alternative to not feeding carbohydrates is increasing the protein or fat content of a food to meet the body's energy requirement. Protein is not only expensive, but we are facing a climate crisis so adding more protein to a diet, when carbohydrates can play the same role, is irresponsible. As for fats, a group of researchers published a study in 2022 that compared the inflammatory response of dogs fed a high-starch vs. a high-fat diet and found that starch digestion conferred benefits that the high-fat diet did not, such as anti-oxidative effects (Lyu et al., 2022).

Third, carbohydrates, specifically fiber, are important for proper functioning of the digestive tract. Fiber is a type of complex carbohydrate and serves as nutrition for the beneficial gut bacteria. The result, a healthy digestive system.

And fourth, fruits and vegetables, which are considered carbohydrate sources, are packed with nutrients such as vitamins and minerals.

Yes, carbohydrates have been villainized in our culture, but have you ever thought to ask yourself why?

To answer this question, we need to take a deep dive into the different types of carbohydrates that exist, and which ones are commonly used in pet food.

Carbohydrates are commonly classified as simple versus complex. Simple carbohydrates include glucose, sucrose, and lactose, for example. Complex carbohydrates include starch and fiber. Starch can be broken down by mammalian enzymes and is therefore the main carbohydrate source used in com-

mercial dog foods, as it can be easily digested and is necessary for successful extrusion of kibble.

When heated, starches undergo a process called gelatinization, which makes them easier to digest.

Fiber cannot be broken down by mammalian enzymes, and instead is broken down by microbial enzymes, providing a food source for the bacteria in the large intestine. Upon fermentation of the fiber, these bacteria produce short-chain fatty acids (SCFAs) that nourish intestinal cells and prevent the overgrowth of pathogenic bacteria.

Fiber aids in managing diseases such as obesity, diabetes, diarrhea, and constipation. It can be classified based on fermentability—basically its potential to be broken down by intestinal bacteria, produce SCFAs, and confer beneficial effects on the gastrointestinal tract. Beta-glucans, for example, are a type of fermentable fiber that are found in the cell walls of certain types of plants, some yeasts, bacteria, fungi, and algae. Beta-glucans increase the amount of beneficial bacteria in the gut while protecting against pathogenic or harmful bacteria. This helps lead to health benefits such as improvement of immune function by influencing gut-associated immune cells. Beta-glucans have also been shown to decrease inflammation, improve blood sugar regulation, lower cholesterol, and benefit heart health.

As I have alluded to, maintaining a healthy gut flora and gut lining is important as they act as barriers from invasion by gut pathogens. In fact, imbalances in the gut microflora have been linked to diseases such as allergies and inflammatory bowel disease. This should not be too surprising as 70%–80% of the immune system is located in the wall of the intestinal tract, making the gut-associated lymphoid tissue (GALT) the largest immune organ in the body. As I mentioned in the Preface, dysbiosis creates inflammation of the GALT, which allows for antigens to enter the bloodstream, resulting in chronic cellular inflammation, and ultimately, chronic inflammatory disease.

Getting back to the question I posed—why are carbohydrates villainized? Well, it's because of simple carbohydrates. Simple carbohydrates include processed sugars such as table sugar, and refined grains which are those that have had their fibrous and nutritious parts removed, such as white flour. Rest assured, these are not the types of carbohydrates that are used in our dog foods.

The carbohydrate (starch and fiber) sources in Wild Earth Performance Formula and Maintenance Formula are:

Barley is an ancient grain that is not only a source of healthy energy and fiber, but also contains protein, B vitamins, minerals, and antioxidants.

Oats are a rich source of healthy dietary fibers, energy, and protein. They are also high in omega-6 fatty acids, which help maintain a healthy skin and coat.

Sorghum is an ancient grain that not only provides energy and fiber, but also contains muscle-building protein, antioxidants, vitamins, and minerals.

Millet is a nutritious ancient grain that not only provides a natural source of energy, but also adds muscle-building protein to our food. It is loaded with soluble and insoluble fiber and is high in antioxidants, vitamins, and minerals.

Brown rice is an ancient whole grain rice that not only provides healthy energy, but is also a great source of omega-6 fatty acids and fiber.

Sweet potatoes are a great source of energy as well as vitamins, minerals, and the antioxidant beta carotene which supports vision and a healthy immune system.

Pumpkin is a fiber-rich food that is also loaded with vitamins such as vitamins A, E, and C as well as minerals like potassium and iron.

Spinach is packed with fiber, antioxidants, and iron as well as vitamins A, B, C, and K.

Blueberries are a great source of antioxidants, fiber, vitamins, and minerals.

Cranberries are a superfood rich in antioxidants, vitamins, and minerals important in maintaining the immune system, heart, bone, and digestive health to name a few.

Inulin is a prebiotic fiber that not only helps maintain gut health but also naturally adds sweetness and flavor

Fructooligosaccharide (FOS) is a prebiotic fiber found in a variety of fruits and vegetables. FOS improves digestibility and the absorption of dietary calcium, iron, and other minerals.

There is no official carbohydrate level recommendation provided by AAFCO. The carbohydrate level in most commercial dog kibble ranges from 30%–65%. As a final note, be aware that a common starch used in meat-based dog kibble is wheat, which is the fourth most common dog food allergen, following beef, dairy and chicken.

Calculating Carbohydrates

Carbohydrates % = 100% - crude protein % - crude fat % - crude fiber % - ash % - moisture %

Fat—The *Importance* of Omegas

Why do dogs need fat in their diet? First and foremost, fat is the most concentrated form of energy, meaning it provides more energy than either carbohydrates or protein—2.5 times more to be exact. Aside from providing energy, fat provides essential fatty acids, allows for the absorption of fat-soluble vitamins A, E, D and K, and plays many vital roles in the body. It also gives food a better texture. Once digested, fats are broken down into fatty acids, which are classified as saturated or unsaturated. To further classify fatty acids, they are either considered essential or non-essential based on whether they must be obtained via the diet. Essential fatty acids are polyunsaturated and belong either to the omega-3 or omega-6 family, which differ with respect to the location of the first double bond, as well as their effects on the body. Omega-3 polyunsaturated fatty acids (PUFAs) have anti-inflammatory effects, while omega-6 PUFAs are pro-inflammatory.

The omega-3 essential fatty acids are alpha-linoleic acid, eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA). Alpha-linoleic acid can be converted into EPA, but dogs are unable to convert alpha-linoleic acid to DHA as efficiently. Therefore, DHA should be provided in the diet in sufficient amounts to support optimal health, which is especially important for puppies and seniors. Non-animal sources of DHA and EPA are phytoplankton and marine algae.

The omega-6 fatty acids include linoleic acid, gamma-linoleic acid, and arachidonic acid. Unlike cats, dogs are able to synthesize gamma-linoleic and arachidonic acid from linoleic acid in order to meet their needs, therefore only linoleic acid is considered essential.

In addition to their role in immune function, omega-3 PUFA's play a vital role in cell membrane structure and function, brain, heart, joint, skin, and coat health. Omega-6 fatty acids are involved in blood clotting, metabolism regulation, and are required for normal growth and development, reproduction, brain function, skin, and coat health.

As mentioned, omega -3 and -6 PUFAs work together to control inflammation. Omega-3 PUFAs produce hormones that decrease inflammation, while omega-6 PUFAs have a pro-inflammatory effect, which is an important part of the immune response. Balance between the two is imperative to maintaining

a healthy immune system, resulting in maximum positive health effects. If the diet is too omega-6 heavy, chronic inflammation may result, potentially leading to health issues such as allergies, arthritis, inflammatory bowel disease, and cancer. Conversely, if the diet is too omega-3 heavy then the immune system cannot function appropriately. Although there is no conclusive data regarding the optimal omega-6:omega-3 ratio, and the AAFCO recommendation allows for levels up to 30:1, many veterinarians agree that a 4:1 ratio is ideal. Some dog food manufacturers will include the omega-3 and omega-6 levels in the guaranteed analysis for transparency.

At Wild Earth, we value the importance of omega-3 and omega-6 fatty acids, and go one step further to guarantee that your dog is receiving the appropriate amounts of these essential fatty acids. Both omega-3 and omega-6 levels are found in our guaranteed analysis above the levels recommended by AAFCO.

Each distinctive fat source provides differing amounts of these essential fatty acids, and therefore must be expertly chosen to provide the correct quantities of omega-3 and omega-6 essential fatty acids. Both animal and plant sources of fats and oils are traditionally used in commercial meat-based kibble production, however, essential fatty acid requirements can be met, and even exceeded, using plant-based ingredients alone. Flaxseed, for example, is plentiful in omega-3's, whereas sunflower oil is plentiful in omega-6's. Furthermore, as mentioned, phytoplankton and marine algae can be used to provide DHA and EPA.

Below you will see the fat sources used in our Performance Formula and Maintenance Formula:

Marine microalgae is a rich source of DHA, an omega-3 fatty acid important for brain development and brain health. This is especially important for puppies and senior dogs.

Canola oil contains largely omega-6 fatty acids, but also omega-3 fatty acids and vitamin E.

Flaxseed is a rich source of healthy dietary fiber and also contains abundant omega-3 fatty acids.

Sunflower oil is rich in essential omega-6 fatty acids.

Safflower oil is also an excellent source of omega-6 fatty acids.

It is important to note that the AAFCO minimum fat requirement is 5% DM for adult maintenance and 8% DM for growth and reproduction.

Vitamins and Minerals— The Micronutrients

Moving on to the micronutrients—vitamins and minerals. Minerals play diverse and important roles in the body, acting as structural components of tissues and organs, a part of body fluids, as well as catalysts and cofactors in enzyme and hormone systems. They are classified as macro vs. micro based on whether they are required from the diet in larger or smaller amounts respectively. Minerals must be maintained in specific concentrations for optimal growth, health, and fertility.

**Macrominerals
include:**

Calcium	Potassium
Phosphorus	Chloride
Sodium	Sulfur
Magnesium	

**Microminerals
include:**

Iron	Selenium	Fluorine
Zinc	Manganese	Boron
Copper	Cobalt	Chromium
Iodine	Molybdenum	

Historically, meat-based diets have been thought to provide more available sources of certain minerals than plant-based diets because they contain organic forms of minerals (meaning the mineral is bound to a molecule containing carbon). A group of researchers investigated the validity of these claims by feeding eight dogs two vegetable ingredient based diets versus two animal ingredient based diets, and measuring the digestibility of minerals. They found that the digestibility of minerals were actually similar or greater in dogs fed diets that are vegetable-based compared to those fed diets that are animal-based (C. L. Cargo-Froom et al., 2017).

Not only was the bioavailability of endogenous minerals in vegetable ingredient based diets found to be higher, demonstrating that plant-based di-

ets can provide the necessary minerals that dogs need, but also, the reality is that many of the minerals in both plant-based and meat-based dog food today come from supplemented minerals. This means that while many of the ingredients used to prepare commercially available dog foods contain minerals, supplemental minerals are usually added to the food as “premixes.” Premixes help ensure that the correct levels of the micronutrients are evenly distributed in the finished product. Organic forms of minerals (aka chelated minerals) are also commercially available as premixes. Chelated minerals, often used in high quality dog foods, are those that are already bound to amino acids, which may make it easier for the body to absorb and metabolize for critical functions essential to health. Chelated and non-chelated forms are often used together to ensure adequate mineral levels.

How do you know whether a dog food contains chelated minerals? Chelated minerals can be identified in the ingredients list on a pet food label as a “proteinate” or “chelate.” An example found in our Wild Earth Performance Formula is “copper proteinate.”

Similar to minerals, vitamins must be maintained at optimal concentrations to avoid deficiency or toxicity, and are also added as premixes to ensure nutritional adequacy and safety.

Vitamins function to help regulate processes in the body. They have incredibly diverse physiologic functions, and are classified as fat-soluble or water-soluble. Fat-soluble vitamins—vitamins A, D, E, and K—are stored in fat in the body, and therefore daily intake is not as vital. Water-soluble vitamins, such as B vitamins and vitamin C, however, must be consumed daily.

Water soluble vitamins include:

Thiamin (B1)	Pyridoxine (B6)	Cobalamin (B12)
Riboflavin (B2)	Pantothenic acid	Biotin
Niacin	Folic acid	Vitamin C

Fat soluble vitamins include:

Vitamin A	Vitamin E
Vitamin D	Vitamin K

Several of these vitamins have historically been isolated from animal sources, however, plant sources have been identified for many of those. For the remaining, synthetic versions can be used when formulating plant-based diets. The body is able to use naturally formed and synthetic vitamins in the same way, although they may have different availabilities (Hand et al., 2010). To account for these differences, as well as the effects food processing has on vitamin stability and availability, fortification of the food to meet a dog's vitamin requirement for their life stage, overcome processing and storage losses and avoid toxicity with supplemental vitamins is necessary. This is to say that, similar to minerals, nearly all commercial pet foods contain added vitamins as formulating a pet food to meet vitamin requirements entirely from ingredient sources is extremely challenging.

As a reminder, it is important to choose a complete and balanced food for a dog's specific life stage. Each life stage not only has unique energy and macronutrient needs, but they have different requirements for vitamins and minerals as well, with growing and reproducing animals requiring higher levels. Furthermore, given that both vitamins and minerals are supplemented in the majority of commercially available diets, vitamin and mineral supplements are not necessary unless managing a certain disease that affects vitamin metabolism.

Comparing Plant-Based Diets to *Other Diets*

Whether someone is feeding their dog a raw meat-based diet, traditional meat-based kibble, or plant-based they likely feel strongly about the benefits of their decision. Feeding our pets is a way that we are able to strengthen the human-animal bond, and even better, providing our pets with food is an easy way for us to directly influence their health.

Today, it is easy to access information; however what is often overlooked is that it is just as easy to access misinformation. As I have explained, the pet food industry and the pet industry in general often relies on pet parents' lack of knowledge, therefore it is important to take a critical approach.

If your veterinarian is opposed to your feeding choice, ask them to provide you with evidence as to why this may harm your pet. If they have questions for you, provide them with scientific research from reputable sources, as well as contact information for the food company making the diet you are feeding so they can reach out with any questions they may have. A board certified veterinary nutritionist will always be the best source of information for what to feed your pet.

In this chapter, I will compare a plant-based diet to other popular diets, including traditional meat-based kibble diets and raw meat-based diets (RMBD). Please keep in mind I am discussing only commercially-available diets. I will not be discussing homemade diets as these are often nutritionally incomplete and unbalanced, and may pose additional health risks.

As mentioned earlier, the reason meat is often a large part of a dog's diet primarily rests on the misconception that dogs are carnivores like wolves, and therefore need animal-based ingredients to thrive. I hope that by now, you realize this is untrue.

Let's begin with raw meat-based diets (RMBDs). Types of commercially available RMBDs include (Stogdale, 2019):

1. **Commercial raw frozen, freeze-dried, or dehydrated meat diets** that are not complete and balanced. These require the addition of a combination of bones, a vitamin and mineral mix, vegetables, and fruit.
2. **Commercial raw frozen complete and balanced diets** with a variety of protein sources. Some are limited to one protein source, especially those using exotic meats. Freezing kills a variable percentage of bacteria.
3. **Commercial freeze-dried complete and balanced diets** that have been frozen under vacuum to remove nearly all moisture. Freeze-drying leaves the food nearly unchanged compared with raw frozen diets, and kills a percentage of bacteria.
4. **Commercial dehydrated complete and balanced diets** that have been heated slowly to remove nearly all the moisture. Whether the low heat has a significant effect on the nutritional quality of the food is unknown. The drying results in a reduction of microbial numbers but Salmonella and other pathogenic bacteria can survive.
5. **Commercial high pressure pasteurized (HPP) complete and balanced diets** that have been subjected to high pressure without heating. This process kills most bacteria including Salmonella and Listeria without altering nutritional quality.

When compared to meat-based kibble diets, a 2021 study based on data from a questionnaire found that dogs fed a RMBD in their postnatal period (1–6 months of age) had a lower risk of developing inflammatory bowel disease later in life, whereas those fed kibble had a higher risk (Hemida et al., 2021). The authors attributed this to a change in the microbiome of RMBD-fed dogs, however these same possible alterations in the microbiome led to adverse effects in another study. In the study, 33 dogs were fed either a “sensitive skin” meat-based kibble diet or a commercial raw food diet (Anturaniemi et al., 2020). While those fed a RMBD had several positive changes on blood work such as a lower serum cholesterol, alkaline phosphatase and glucose, they also experienced a significant decrease in folate, B12 and iron. Based on the current evidence to date, research on RMBDs does not show a clear benefit on the gut microbiome, and may increase the risk of pathogen exposure (Wernimont et al., 2020).

Anecdotes surrounding RMBDs include that they have anti-inflammatory and/or anti-oxidative effects as they theoretically contain higher levels of antioxidants and lower levels of heterocyclic amines (HAs). HAs are produced when muscle meat is cooked at a higher temperature such as during the production of meat-based kibble diets. Furthermore, those who choose RMBDs often claim that these diets are nutritionally superior and provide many benefits such as a shinier coat and improvement in energy and immunity. Un-

fortunately, many of these health benefit claims have not been scientifically evaluated and therefore remain unproven. Moreover, there exist many risks associated with feeding RMBDs.

First, upon evaluation, many commercial RMBDs have had nutritional imbalances such as incorrect calcium to phosphorus ratio (Stogdale, 2019). This is especially true for those produced by small companies avoiding synthetic nutrient supplements. Many RMBDs are also high in fat—while potentially leading to coat improvements, higher fat diets can also cause gastrointestinal issues and increase the risk for obesity as they are easy to overfeed due to increased palatability. Third, RMBDs that require the addition of bones, pose a risk for intestinal obstruction and/or perforation. Many RMBDs are also often grain-free, and investigations between the potential link of grain-free diets to canine dilated cardiomyopathy are ongoing.

Next, due to the nature of raw diets, they are inherently prone to bacterial contamination. In fact, reports of raw meat pet food containing zoonotic foodborne bacteria, including *Salmonella*, *Escherichia coli*, and *Listeria monocytogenes*, are increasing (Jones, 2019). While many dogs may tolerate pathogens, others succumb to illness, and some have even died due to infection with pathogens in their raw food diets. Prevalence rates for contamination with *Salmonella* in commercial RMBDs ranges from 20% to 48% (Freeman, 2013). As for other pathogenic bacteria, according to a report published by Public Health England in 2017, of four individuals (one of which died) infected with multidrug-resistant (MDR) *E.coli* O157, three were feeding a raw commercial frozen diet to their dog (Byrne et al., 2018). All were positive for shiga toxin-producing *E.coli*, and in one case the bacteria was cultured out of the freezer. This clearly demonstrates that although freezing and freeze-drying may reduce the number of bacteria, it does not destroy all pathogens. These pathogens will continue to be shed in the feces even if the dog consuming the RMBD does not show signs of illness. This poses a risk for humans who come into contact with the dog, especially people who are young, old, pregnant or immunosuppressed. Another human health risk associated with feeding RMBDs is exposure to resistant bacteria which can provide a source of antibiotic resistance in humans. Several studies published in the United Kingdom and the Netherlands have provided clear and compelling evidence that dogs fed RMBDs are shedding significantly more antibiotic-resistant bacteria than those fed cooked diets (Baede et al., 2017, Wedley et al., 2017, Schmidt et al., 2015).

Based on overwhelming scientific evidence, The American Veterinary Medical Association and the American Animal Hospital Association oppose the unregulated feeding of raw foods and discourage “the feeding to cats and dogs of any animal-source protein that has not first been subjected to a pro-

cess to eliminate pathogens, because of the risk of illness to cats and dogs, as well as humans” (AAHA.org, AVMA.org).

Aside from the risks posed by meat-based kibble diets mentioned earlier in the chapter “Dog Food Evolution and Safety”, such as the use of rendered products and the presence of toxins including euthanasia drugs, meat-based kibble diets are also prone to bacterial contamination. In fact, there have been over 180 dog food recalls since 2009, with some of the major ones from bacterial contamination of meat sources used in meat-based kibble.

Earlier I also mentioned that kibble was made using the same process used to make breakfast cereals, high heat extrusion. During this process, wet and dry ingredients are mixed together to form a dough. The dough is then cooked under high pressure and high temperature and pushed through a machine to cut the kibbles. The kibble is then dried, cooled and spray coated. On the surface this process seems benign—after all, who doesn’t love cereal? However, the problem lies in what happens to the meat when it is subjected to high temperature. Heterocyclic amines are compounds formed when muscle meat is cooked at a high temperature, and have been associated with cancer in research animals when consumed in high concentrations (Sugimura et al., 2004). It is important to note here that while heat processing of moist or dry extruded pet foods may have a negative impact on animal tissue proteins, heat processing improves the bioavailability of some plant proteins.

As for the benefits of meat-based kibble diets, these diets have the most amount of research behind them because the largest companies in the pet food industry make mostly meat-based kibble and have the money to fund studies including feeding trials to support nutritional adequacy. Furthermore, these diets offer convenience to pet parents, while also usually being lower in cost when compared to both RMBDs and plant-based kibble diets. Proponents of feeding meat-based kibble also claim reduced dental tartar and improved gum health. While this claim is supported by research, kibble size does matter (and this likely applies to plant-based kibble diets as well). A study published in 2007 concluded that increasing the kibble size by 50% resulted in a 42% decrease in the accumulation of dental tartar (Hennet et al., 2007).

Plant-based diets are inherently free of many of the risks associated with RMBDs and meat-based kibble diets described above. They are also free of the most commonly reported food allergens for dogs, making plant-based diets a great option for dogs with food allergies, and why many food-allergic dogs have experienced symptom relief on plant-based diets. Plant-based diets also offer many other benefits, and when compared directly to conventional meat-based kibble and RMBDs, a recent study found that “the pooled evidence to date indicates that the healthiest and least hazardous dietary choices for dogs are nutritionally sound plant-based diets” (Knight, 2022). In the following

chapter I will dive into this study as well as additional research that supports plant-based feeding in dogs.

Why Choose A *Plant-Based* Diet?

“Dog longevity was reported to be greater for dogs fed plant-based diets. (Dodd, 2022)”

So why choose a plant-based dog food when there are so many other dog foods on the market? Well, there are a variety of reasons which include the overall health and wellbeing of your dog, food allergies, meat quality concerns, the environment and farm animal welfare.

Let’s start with health, because after all, our fur babies deserve the very best. As I mentioned earlier, the most common culprits involved in dog food allergies are beef, chicken, and dairy, which plant-based diets are inherently free of.

Aside from allergies—while historically there has been a lack of evidence supporting plant-based feeding in dogs, there has been an explosion of research in the past several years demonstrating the value of plant-based diets for dogs.

Before diving into the more recent research, a foundational study conducted in 2009 is worth mentioning as it was the first to demonstrate that a carefully balanced meat-free diet can maintain normal hematological values in exercising dogs (Brown et al., 2009). In this study, sprint-racing sled dogs were fed either a complete and balanced plant-based or meat-based diet. Blood work results for all dogs, regardless of diet, were within normal range throughout the study, and the consulting veterinarian assessed all dogs to be in excellent physical condition. No dogs in the study developed anemia, and instead red blood cell counts and hemoglobin values increased significantly over time in both groups of dogs. This study showed that a carefully balanced meat-free diet could provide all the nutrition dogs need, even very active dogs. Since this foundational study, research has continued to emerge supporting plant-based feeding.

In 2016, a group of researchers investigated the evidence from four previously published studies that examined the nutritional soundness of plant-based commercial diets and the health status of dogs maintained on vegetarian and meat-based diets (Knight, 2016). The authors concluded that it is

entirely possible for companion animals to thrive on vegetarian diets, but these must be nutritionally complete and balanced. Such diets have been associated with benefits such as improved coat condition, allergy control, weight control, increased overall health and vitality, arthritis regression, diabetes regression, and cataract resolution.

In a separate study published in 2021, authors assessed the short-term amino acid, clinicopathologic, and echocardiographic findings in healthy dogs fed a commercial plant-based diet (Cavanaugh et al., 2021). Thirty dogs fed a commercial extruded plant-based diet (PBD), using pea as the main protein source, were compared to a non-randomized control group of 4 dogs fed different brands of commercial extruded traditional meat-based diets (TD). The results of this study indicated that the health of the dogs was maintained and did not deteriorate after 12 weeks on a PBD. Moreover, plasma and whole blood taurine, as well as all essential amino acids, except methionine, were higher in dogs fed the PBD compared to baseline. These findings suggest that plant-based diets can be formulated and processed to achieve taurine and other nutrient targets in dogs.

In regards to the manufacturing of plant-based diets, a study demonstrated that upon review, plant-based diets were seen to have been produced at equal or superior standards to meat-based diets, with acceptable or superior standards overall at all stages of formulation (Knight et al., 2021). Not only can commercially available plant-based diets be of high quality and be healthy, but they can also be delicious and satisfying to dogs. In 2021, a group of researchers from the University of Winchester surveyed the owners of 2,308 dogs (and 1,135 cats), and found that those who were fed plant-based diets for at least one year were just as eager to eat and just as healthy as those fed meat-based diets (Knight & Satchell, 2021).

In 2022 alone, three new survey studies were published—all which suggest that a plant-based diet may be healthier for some dogs than conventional diets and promote longevity for our best friends. The first of these, an owner survey, found that dogs who were fed plant-based diets “reported fewer health disorders, specifically with respect to ocular, gastrointestinal and hepatic disorders” (Dodd et al., 2022). Dog longevity was also reported to be greater for dogs fed plant-based diets, with purely plant-based dogs reportedly living 1.5 years longer than dogs fed meat.

The second of these studies evaluated the health perceptions of 100 pet guardians who fed their dog a plant-based diet, and found that dogs who were fed plant-based dog food found the food palatable, with no adverse changes in appetite or weight (Davies, 2022). Health improvements after 3–12 months were also reported in coat glossiness, dandruff, skin inflammation, itchiness, external ear canal crusting, fecal consistency, defecation frequency, flatus fre-

quency, flatus antisocial smell, anxiety, aggressive behavior, and stool consumption.

Lastly, the third of these peer-reviewed studies included over 2,500 dogs, and revealed that dogs who eat a well-balanced plant-based diet require less medication, visit the vet less frequently, and suffer from fewer health disorders according to their owners when compared to dogs who eat conventional meat-based kibble diets—suggesting that a plant-based diet may be healthier for some dogs (Knight et al., 2022).

Several of these studies were also included in a literature review published in 2023 that analyzed the health impacts of a plant-based diet in cats and dogs. The authors concluded that there is no overwhelming evidence of adverse effects resulting from the feeding of plant-based diets to dogs (or cats), and that there is evidence of benefits (Domínguez-Oliva et al., 2023). Because many of these studies were either short in duration and/or based on the opinions of owners, there exists a need for future high-quality, randomized, controlled studies, with standardized outcome measures, large sample sizes, and longer duration.

With this need identified, a group of clinician-scientists from Western University of Health Sciences' College of Veterinary Medicine conducted the first comprehensive study on the long-term effects of plant-based diets for dogs. Fifteen clinically healthy client-owned dogs were fed a complete and balanced plant-based diet for a year (Linde et al., 2023). Clinical, hematological, and nutritional parameters were evaluated at 0, 6 and 12 months, including complete blood count, serum chemistry, cardiac biomarkers, plasma amino acids, and serum vitamin concentrations. Comparative analysis of blood work and urinalysis showed no clinically significant changes between baseline, intermediate, and endpoint values. Furthermore, bloodwork values (CBC and blood chemistry) remained within normal reference ranges throughout the study.

A common misconception regarding plant-based diets is that they provide less protein than traditional meat-based diets (which we know is untrue). The researchers further busted this myth by measuring the levels of essential amino acids—all of which were within or above normal reference ranges, with an upward trend. L-aurine and L-carnitine levels were also measured, and an increase in these nutrients was also observed when comparing baseline to endpoint values.

As mentioned, concentrations of vitamins were also evaluated. A very interesting and positive finding was seen with vitamin D. Seven dogs presented with vitamin D insufficiency as a result of eating a meat-based diet prior to the start of the study, and after six months of eating a plant-based diet, only one dog was insufficient—and by 12 months all dogs had normal vitamin D levels.

As for vitamin A, concentrations stayed within the reference range and exhibited an upward trend. Vitamin E levels were more than adequate throughout. Lastly, as for B vitamins, folate was below the reference range in six dogs at the outset of the study and by 12 months only three of those dogs had low folate. Cobalamin was within the normal reference interval at all three time points.

In order to evaluate heart health, cardiac biomarkers Cardiac troponin I (cTnI) and NT-proBNP were measured at the three time points, and not only did they maintain within reference ranges, but there was a downward trend in both. Furthermore, cTnI levels were increased in three dogs at baseline, compared to only one dog at endpoint.

Also interesting to note, the body weight of the dogs remained stable, while body condition scores trended downwards in overweight/obese dogs. Plant-based diets have long been correlated with a healthy body weight and this data serves to further support that. As we know, dogs at a normal body weight live on average two to two-and-a-half years longer than overweight/obese dogs (Salt et al., 2019).

Given the results, the authors concluded that health was maintained after 12 months of being fed a commercial plant-based diet.

This study surpassed AAFCO feeding trial guidelines, which recommends a minimum study period of six months and only eight dogs with health exams performed by a licensed veterinarian and assessment of four blood parameters including hematocrit, hemoglobin, albumin, and alkaline phosphatase.

Not only are plant-based diets able to meet the nutritional needs of dogs, are associated with fewer health disorders and increased longevity, but they also address concerns regarding farm animal welfare and environmental sustainability. Factory farming is not only cruel, but also brings with it environmental impacts and human health risks. Farm animals are raised in unimaginably horrible conditions and are subjected to suffering their entire lives. They are confined, abused, and treated in the worst ways possible. And to add to that, historically, pet food was typically produced with those animals and the parts of animals that were unfit for human consumption, but now with fresh food and human-grade dog food becoming more popular, more farm animals are raised and slaughtered to meet this demand. Pet food constitutes about 25–30% of the environmental impacts from animal production in terms of the use of land, water, fossil fuel, phosphate, and biocides. “Compared to a

plant-based diet, meat requires more energy, land and water to produce, and has greater environmental consequences in terms of erosion, pesticides and waste” (Okin, 2017).

Food Allergies and *Plant-Based* Diets

I've found firsthand that when dogs that are experiencing food allergy symptoms such as itching and recurrent skin infections, switching them over to alternative protein sources, such as dried yeast, allows them to experience symptom relief. If you are switching your dog over to a plant-based dog food because you suspect or have confirmed food allergies, expect to feed the food for about three months to see improvement. Many dogs experience relief much sooner, but it is important to give your dog time to adjust. I am sharing a few tips specifically for those food allergic dogs, to ensure that they have the very best chance for relief.

Tip 1: Make sure you are completely eliminating animal-based products, including those given as treats, supplements and/or in flavored parasite preventatives. For flea/tick/heartworm preventatives, I recommend using these year-round, so be sure to switch over to an unflavored version or one free of animal-based proteins. As for treats, you can try using plant-based treats, which are free of the most common allergens, to show your pup just how much you love them—without the itch!

Tip 2: Make sure to check in and see your dog's vet so they can rule out and address any possible infection. Allergies result in chronic inflammation and an impaired skin barrier, which, coupled with trauma caused by constant scratching can make pets more susceptible to infection. For example, that reddish-brown discoloration on your pet's paw that they are constantly licking is actually a yeast infection. Even if food allergies were the culprit, and you have since removed the offending food, that infection still needs to be treated for the infection to go away. Make an appointment with your veterinarian to make sure your pet is evaluated, and the appropriate treatment is prescribed.

Tip 3: If you have not seen an improvement in your dog after three months, consider that your pet may have more than one type of allergy, such as environmental allergies or flea allergies.

Conclusion

While helping to save the environment and protecting countless animals from suffering and slaughter certainly have merit, canine health is at the forefront when determining what to feed our dogs. After all, nutrition is the fifth vital assessment, right next to temperature, pulse, respiration, and pain—which highlights just how important nutrition is. In this book, I have provided evidence supporting plant-based diets in dogs; and it is my hope that by now you have come to see that a plant-based diet can be nutritionally complete and balanced given it is carefully formulated, digestible, and bioavailable. By no means am I suggesting that all plant-based diets are nutritionally sound, and therefore I urge you as a pet parent and your dog’s biggest advocate, to think critically when evaluating a diet.

It is important to remember that there is an abundance of misinformation that often goes against the science-based evidence.

Complete and balanced plant-based diets should be given equal consideration to meat-based diets, especially given the current understanding of pet nutrition, and the emphasis on nutrients not ingredients. Currently, meat-based diets are evaluated based on whether they meet AAFCO requirements for nutritional sufficiency and plant-based diets should be evaluated using the same criteria.

My goal in writing this book was to arm dog parents with factual information so that you feel able to take the best steps towards improving the health and happiness of your dog. A nutritionally complete and balanced plant-based diet can meet the nutritional needs of dogs, and help dogs live healthier and longer lives—all in a sustainable and cruelty-free way.

“Given the current understanding of nutrition and emphasis on nutrients not ingredients, plant-based diets should be evaluated using the same criteria used for meat-based diets - whether they meet AAFCO requirements for nutritional sufficiency.”

– Tiffany Ruiz Dasilva, VMD, cVMA

About the *Author*



Dr. Tiffany Ruiz Dasilva is a creative, versatile, passionate, and enthusiastic veterinarian with expertise in canine nutrition. Her areas of interest include animal nutrition, behavior, pain management and pet parent education, with the overarching goal of improving the human-animal bond. She received her Bachelor of Science degree in Biology with a focus on Brain and Behavior from Brown University.

Following graduation, she lived in Africa, working in wildlife conservation and rehabilitation, helping to prepare diets and care for sick, orphaned, and injured wildlife. She received an academic scholarship to attend veterinary school at the University of Pennsylvania, completing research in genomics and diabetes at the Children's Hospital of Philadelphia.

Following graduation, Dr. Ruiz Dasilva worked in general practice, on telehealth platforms, and received her Fear Free certification, which aims to prevent and alleviate anxiety and stress in the animals she cares for.

In 2020, in response to the lack of access to veterinary care during the pandemic, she created an affordable, multilingual telehealth platform in an effort to make veterinarians more easily accessible, and, in turn, provide pet parents with factual information to optimize their pet's health. As accessibility to in person care returned, she channeled her passion for improving the human-animal bond into pursuing a certification in acupuncture and began working at a rehabilitation practice. It was during this time, coupled with her previous experiences, that she continued to realize the immense importance of nutrition in chronic disease and overall health, leading her to pursue the position of veterinarian at Wild Earth, a plant-based pet food company.

She has gained expertise in the field of nutrition through numerous certifications and coursework, and believes that lifelong learning and questioning is key. She has worked tirelessly to compile the evidence for plant-based feeding in dogs, has spoken to leading experts in the field, and has come to see the ben-

efits of a plant-based diet for longevity and symptom relief for many dogs. As part of her role at Wild Earth, Dr. Ruiz Dasilva advises at all stages of product development, presents at conferences, and helps to educate pet parents and veterinarians.

“It is my mission to educate both pet parents and veterinarians alike on the importance of nutrition, and how a nutritionally complete and balanced plant-based diet can meet the nutritional needs of dogs in a sustainable and cruelty-free way. My goal is to provide evidence-based data to those who seek it, and to be a reliable source of information to help dogs live longer, healthier, and happier lives.”

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