



Nutrition

REFERENCE MANUAL



LIFESTAGES

FEEDING AMOUNTS

TRANSITION

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UNCONVENTIONAL FOODS



Nutrition

REFERENCE MANUAL

According to The American Animal Hospital Association (AAHA) only seven percent of pets that could benefit from a therapeutic food are actually on such a regimen.* Because good nutrition is integral to optimal animal care, it's critical to incorporate a nutritional assessment and specific nutrition recommendation into each visit. In order to give healthcare teams a roadmap to implementing this best client care, AAHA released the *Nutritional Assessment Guidelines for Dogs and Cats* in July 2010.

Likewise, this *Nutrition Reference Manual* was developed to help healthcare teams when providing clients with a nutritional assessment and recommendation. Your entire healthcare team can use this resource to help answer client questions and concerns, as well as to help initiate conversations with clients regarding proper nutrition.





Lifestages

Puppy/Kitten
Adult/Senior

Feeding Amounts

Exercise Tips
Calculating Daily Energy Requirements

Transition

Palatability Tips
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Helpful Definitions

Omnivores vs. Carnivores
Organic/Natural/Holistic
By-products
Preservatives
Truth about Corn

Pet Food Labels

AAFCO Standards
Understanding the Label
Ingredients and Nutrients

Unconventional Foods

Bones and Raw Food Formula
Homemade Foods



Nutrition: Puppy/Kitten

Age: Up to 1 year of age



▶ AT A GLANCE

When compared to adult pets, puppies and kittens require a food with:

- Higher fat and calories
- Higher protein
- More energy (fat)
- Higher/controlled mineral levels
- Less calcium and energy (fat) - Large breed puppies
- Added taurine - Cats

LIFESTAGE REQUIREMENTS

Precisely balanced nutrition is vital to the overall health and development of pets. During the first year of life, proper nutrition plays a significant role in providing puppies and kittens with the right balance of nutrients to address high-energy requirements and proper growth.

For puppies and kittens, vitamin E and DHA are important nutrients for building a strong immunity and neurological function. For large breed puppies, nutrition with less calcium and fat reduces the chances for developing bone and joint abnormalities.

TRANSITIONING

The right level of nutrients promotes good health, which impacts a pet's life expectancy and quality of life. Transitioning to the right food at each lifestage (typically at ages 1, 5 (large breed) and 7) helps meet the changes associated with aging.

For puppies and kittens, switch to adult food at about 10-12 months, typically after the spay/neuter surgery.

Nutrition: Puppy/Kitten *continued*

Nutritional Needs

Feeding a high-quality food specifically designed for growth can help ensure normal, healthy development of a young puppy or kitten. Here are key nutrients identified to aid puppies and kittens in the development process:

VITAMIN	SOURCE	BENEFIT
A	Fish oil, liver, vitamin A supplements	Supports vision, healthy skin and a healthy immune system
D	Liver, vitamin D supplements	Helps build bones and teeth
E+C	Vegetable oils, vitamin E+C supplements	Helps protect cells and supports a healthy immune system

MINERAL	SOURCE	BENEFIT
Calcium	Ingredients that contain bone (such as chicken meal, lamb meal, fish meal)	Supports healthy, strong bones and teeth; helps blood clot and muscle function. Less calcium is required for large breed puppies to help reduce the chance of developing bone and joint abnormalities.
Phosphorus	Meats, eggs, dairy products	Supports healthy, strong bones and teeth; helps cells and muscle function
Sodium	Mineral mix	Maintains body fluid levels and helps muscle function

OTHER	SOURCE	BENEFIT
Proteins	Chicken by-product meal, corn gluten meal and ground whole grain wheat	Helps build strong cells
Carbohydrates	Corn gluten meal, flaxseed and ground whole grain	Provides an easily absorbed, quick source of energy
Fats	Dried egg product, fish oil and soybean oil	Helps pets store energy for later. Less fat is required for large breed puppies to help reduce the chance of developing bone and joint diseases.
Omega 3+6	Eggs, fish oil, flaxseed	Promotes healthy skin and shiny coat
DHA	Omega-3 fatty acid	Essential for proper neurological development

Nutrition: Adult/Senior

Age: 1-7 years of age (Adult)
Over 7 years (Senior)



AT A GLANCE

Adult and senior pets require a food with:

- Less phosphorus
- Less protein
- Less sodium
- Less calcium
- Increased fiber — Senior
- Less magnesium — Cats
- Added taurine — Cats
- Normal acidic urine pH = 6.2-6.4 — Adult Cats

LIFESTAGE REQUIREMENTS

Precisely balanced nutrition is vital to the overall health and development of pets. For adult pets, the ideal balance of vitamins and minerals help them stay healthier, longer.

For mature pets, reduced levels of phosphorus and sodium are important to maintain kidney and heart health.

TRANSITIONING

The right level of nutrients promotes good health, which impacts a pet's life expectancy and quality of life. Transitioning to the right food at each lifestage (typically at ages 1, 5 (large breed) and 7) helps meet the changes associated with aging.

Nutrition: Adult/Senior *continued*

Nutritional Needs

The proper balance of nutrients, avoiding both excesses and deficiencies, is important for the overall health and development of adult and senior pets. Here are key nutrients known to promote and maintain good health in adult and senior pets:

VITAMIN	SOURCE	BENEFIT
A	Fish oil, liver, vitamin A supplements	Supports vision, healthy skin and a healthy immune system
D	Liver, vitamin D supplements	Helps support bones and teeth
E+C	Vegetable oils, vitamin E+C supplements	Helps protect cells and supports a healthy immune system

MINERAL	SOURCE	BENEFIT
Calcium	Ingredients that contain bone (such as chicken meal, lamb meal, fish meal)	Supports healthy, strong bones and teeth; helps blood clot and muscle function.
Phosphorus	Meats, eggs, dairy products	Supports healthy, strong bones and teeth; helps cells and muscle function. Reduced phosphorus helps maintain kidney health.
Sodium	Mineral mix	Maintains body fluid levels and helps muscle function

OTHER	SOURCE	BENEFIT
Proteins	Chicken by-product meal, corn gluten meal and ground whole grain wheat	Helps build strong cells
Carbohydrates	Corn gluten meal, flaxseed and ground whole grain	Provides an easily absorbed, quick source of energy
Fats	Dried egg product, fish oil and soybean oil	Helps pets store energy for later. Less fat is required for large breed dogs to help reduce the chance of developing bone and joint diseases.
Omega 3+6	Eggs, fish oil, flaxseed	Promotes healthy skin and shiny coat
DHA	Omega-3 fatty acid	Essential for proper neurological function

Lifestage Nutrition

Lifestage nutrition is designed to meet the optimal nutritional requirements of animals at the puppy/kitten, adult and senior stages of their lives.



How old is your **FELINE** patient in human years?

LIFESTAGE	PET'S AGE	HUMAN YEARS
Kitten < 1 year	3 mos.	9
	6 mos.	13
Adult 1-6 years	1	19
	2	28
	3	30
	4	38
	5	45
	6	48
Senior 7+ years	7	51
	8	55
	9	59
	10	63
	11	66
	12	69
	13	72
	14	77
	15	81
	16	86
	17	90
	18	95

Lifestage Nutrition *continued*



How old is your **CANINE** patient in human years?

LIFESTAGE	PET'S AGE	HUMAN YEARS	
		SMALL/ MEDIUM BUILD	LARGE BUILD
Puppy < 1 year	3 mos.	6	3
	6 mos.	12	8
Adult 1-6 years	1	17	12
	2	23	24
	3	27	30
	4	32	37
	5	37	43
	6	41	50
Senior 7+ years	7	46	57
	8	50	63
	9	55	70
	10	59	77
	11	64	83
	12	68	90
	13	73	97
	14	78	
	15	82	
	16	87	
	17	92	
	18	96	

Feeding Amounts

DEFINITIONS

DAILY ENERGY REQUIREMENT (DER)

The average daily energy expenditure of any animal, dependent on lifestyle and activity.¹

RESTING ENERGY REQUIREMENT (RER)

The energy requirement for a normal but fed animal at rest, including energy expended for recovery from physical activity and feeding.¹



EXERCISE TIPS

FOR CATS

- Put small amounts of food in multiple bowls in different locations throughout the house
- Create a natural obstacle course, in or around your house that your pet can jump over, crawl over or balance on
- Play with toys
- Play with a laser pointer
- Place kibble inside a food bowl
- Toss kibble for the cat to catch instead of putting kibble in the bowl



FOR DOGS

- Take a 30-minute walk around your neighborhood
- Play fetch with a ball or toy or hide a toy around the house for your pet to find
- Place kibbles inside a food puzzle
- Toss kibbles for the dog to catch instead of putting them in a bowl

Feeding Amounts *continued*

TREATS

Treats should equal no more than 10% of the total diet.

ACCEPTABLE TREATS FOR A HEALTHY WEIGHT LOSS PET



¼ cup of carrots

17 CALORIES



¼ cup of
green beans

9 CALORIES



¼ apple

12 CALORIES



1 treat

Hill's® Prescription Diet®
r/d® Canine Treat

13 CALORIES



10 kibbles

of Prescription Diet®
r/d® Canine Dry

4 CALORIES



10 kibbles

of Prescription Diet®
r/d® Feline Dry

6 CALORIES

FOOTNOTE

¹Gross KL, Yamka RM, Khoo C, et al. Macronutrients. In: Hand MS, Thatcher CD, Remillard RL, et al, eds. *Small Animal Clinical Nutrition*. 5th ed. Topeka, KS: Mark Morris Institute; 2010:61.

Calculating DER

1. Find weight on the chart ›
2. Determine the RER
3. RER x lifestage energy requirement = kcal/day requirement



Feline DER

FELINE LIFESTAGE DAILY ENERGY REQUIREMENTS

LIFESTAGE	DER
Kitten	2.5 x RER
Intact adult	1.4 x RER
Neutered adult	1.2 x RER
Obese prone	1.0 x RER
Weight loss	0.8 x RER



Canine DER

CANINE LIFESTAGE DAILY ENERGY REQUIREMENTS

LIFESTAGE	DER
Puppy (up to 4 mos.)	3 x RER
Puppy (4 mos. and older)	2 x RER
Intact adult	1.8 x RER
Neutered adult	1.6 x RER
Obese prone	1.4 x RER
Weight loss	1.0 x RER

WORKING ADULT CANINE DAILY ENERGY REQUIREMENTS

WORKLOAD	DER
Light	2 x RER
Moderate	3 x RER
Heavy	4-8 x RER

RER

ESTIMATED ENERGY REQUIREMENTS FOR BODY WEIGHTS IN DOGS AND CATS

LBS.	KG	RER (kcal/DAY)
1	0.5	39
2	0.9	65
3	1.4	88
4	1.8	110
5	2.3	130
6	2.7	149
7	3.2	167
8	3.6	184
9	4.1	201
10	4.5	218
11	5.0	234
12	5.5	250
13	5.9	265
14	6.4	280
15	6.8	295
16	7.3	310
17	7.7	324
18	8.2	339
19	8.6	353
20	9.1	366
25	11.4	433
30	13.6	497
35	15.9	558
40	18.2	616
45	20.5	673
50	22.7	729
55	25.0	783
60	27.3	835
65	29.5	887
70	31.8	938
75	34.1	988
80	36.4	1,037
85	38.6	1,085
90	40.9	1,132
95	43.2	1,179
100	45.5	1,225

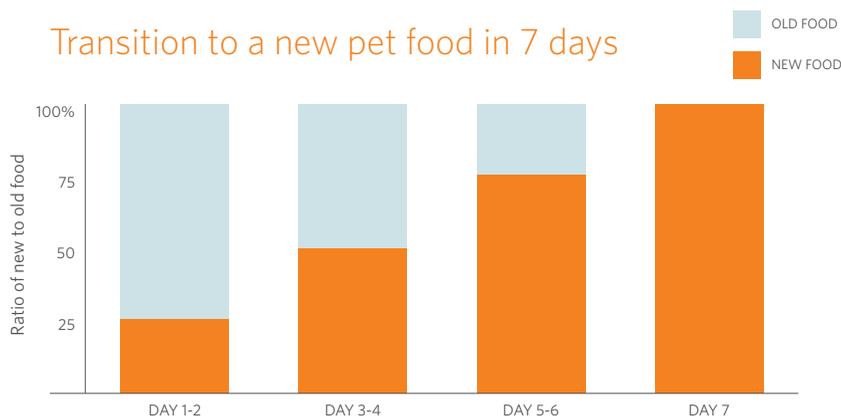


Transition

TRANSITION A period of time during which one food is replaced with another. It is important to recommend a transition; occasionally a pet will have a GI upset when switched to a new diet.

PALATABILITY The degree of acceptability to an animal, as determined by the sensory response to specific chemical and physical characteristics — namely taste, smell and texture. The combination of smell and taste is referred to as “flavor.”¹

Transition to a new pet food in 7 days



- Gradually introduce the new food over a 7-day period by mixing the new food with the old
- If your pet is reluctant to try a new food, hand feed or mix the dry food with warm water
- Don't feed people food — this can decrease the effectiveness of the recommended food
- Always provide plenty of clean, fresh water
- Do not supplement or feed other pet foods, unless advised to do so by the veterinarian
- There is more of a chance to have a GI upset with a hydrolyzed protein diet, high fatty acid, or a diet with high fiber, especially if the pet has not been on this type of diet before
- Some pets will take longer to transition to the new diet

AT A GLANCE

Palatability Tips

- Add low-salt flavored broth
- For dogs: low salt chicken or beef
- For cats: low salt tuna, clam or chicken
- Add a small amount of oregano, except with a novel protein or hydrolyzed protein diet — especially if being used for food allergies
- For dogs only, add a very small amount of corn syrup but only if the dog is not a diabetic
- Warm the food
- For cats, feeding in a wide bowl to prevent the tactile whiskers touching the side of the bowl is advised
- Putting the foods in side by side dishes is another tip to try

Transition *continued*

A CLOSER LOOK

Food aversions

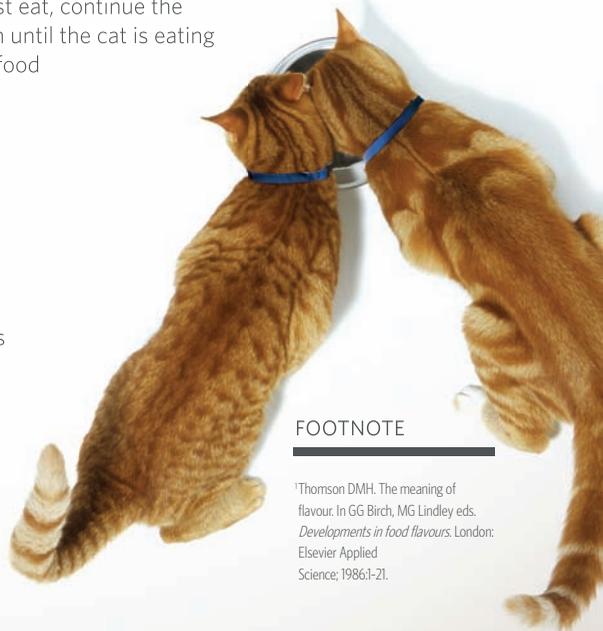
- Cats may develop a learned aversion to certain foods when feeding is paired with a negative GI experience
 - The negative experience can be physical, emotional or physiologic
 - Typically aversions occur when cats are fed before an episode of nausea or vomiting
- Aversions have been known to last up to 40 days in cats
- Do not feed a cat the diet they will go home with in the hospital

Cats and texture

- Cats are very sensitive to the physical form, odor and taste of foods
- Cats accustomed to a specific texture or type of food (moist, dry or semi-moist) may refuse foods with different texture
- Food temperature also influences food acceptance by cats
- Cats do not accept food served at temperature extremes
- Foods offered near body temperature are most preferred
- For a cat with texture issues a longer transition is recommended, this could last as long as 1-2 months
- Be patient with the cat
- Cats must eat, continue the transition until the cat is eating the new food

Feeding multiple pets

- Puppies and kittens must eat a puppy or kitten food until 10 - 12 months of age
- Adult pets should not eat a growth product
- If a pet has no medical issues (especially urinary crystals or stones) the pet can eat adult or senior foods
- If feeding a therapeutic food, make pet owners with multiple pets aware if there are issues that need to be addressed



FOOTNOTE

¹Thomson DMH. The meaning of flavour. In GG Birch, MG Lindley eds. *Developments in food flavours*. London: Elsevier Applied Science; 1986:1-21.

Omnivores vs. Carnivores

DEFINITIONS

- CARNIVORE** An animal subsisting primarily on animal tissue.
- HERBIVORE** An animal subsisting entirely on plant tissue.
- OMNIVORE** An animal subsisting on both animal and plant tissue.

A CLOSER LOOK

- Cats and dogs are both members of the taxonomic order *Carnivora*. But not all species of the order are actually carnivores.



- Some, including dogs and coyotes, are omnivores.¹
- Another member species, the panda, is an herbivore.¹
- Protein metabolism of cats is unique. Kittens require 50% more protein than puppies to support growth. The relative maintenance requirement for protein in the adult cat is even higher: adult cats need about 200% more protein than adult dogs.²

Three amino acids essential for cats²

ARGININE	TAURINE	METHIONINE
Even a single meal devoid of arginine may result in hyperammonemia in less than one hour. ²	Cats can only conjugate bile acids with taurine, unlike other species that can use also use glycine. ²	Approximately 19% of a food must be protein in order to meet the methionine requirement of kittens. ²

AT A GLANCE

Dogs are omnivores because they thrive on a diet consisting of both animal and plant foods.

Cats are true carnivores because they have a higher protein requirement and higher dietary requirements for nutrients that aren't available from plant sources, such as taurine.

Omnivores vs. Carnivores *continued*

OMNIVORE/CARNIVORE MYTHS

MYTH Dogs are carnivores.

TRUTH Dogs belong to the taxonomic order *Carnivora*. But their anatomy, behavior and feeding preferences reveal their ability to eat and remain healthy on a diet consisting of both plant and animal foods, which classifies them as omnivores from a dietary perspective.¹

MYTH Cats should not eat carbohydrates because they are carnivores.

TRUTH It is true that cats are carnivores and have a high dietary protein requirement. But cats can use carbohydrates efficiently for energy.³⁻⁶ The starch levels found in commercial cat foods (up to 35% of the food's DM) are well tolerated.⁷

In queens, carbohydrates spare protein necessary to sustain blood glucose concentrations and provide a substrate for lactose during milk production. Food fed to growing animals and those with high-energy needs should contain at least 20% carbohydrates.⁷

MYTH Cats should not eat carbohydrates because of the risk for diabetes.

TRUTH Currently available evidence does not support a direct cause-and-effect relationship between increased carbohydrate intake and diabetes in cats.⁸ And because of relatively increased amounts of protein, phosphorus and fat, some low-carbohydrate foods may not be ideal for diabetic cats with concurrent conditions (e.g., kidney disease, hepatic disease, pancreatitis).

FOOTNOTES

¹Debraekeleer J, Gross KL, Zicker SC. Introduction to feeding normal dogs. In: Hand MS, Thatcher CD, Remillard RL, et al., eds. *Small Animal Clinical Nutrition*. 5th ed. Topeka, KS: Mark Morris Institute; 2010:251-255.

²Armstrong PJ, Gross KL, Becvarova I, et al. Introduction to feeding normal cats. In: Hand MS, Thatcher CD, Remillard RL, et al, eds. *Small Animal Clinical Nutrition*. 5th ed. Topeka, KS: Mark Morris Institute; 2010:361-372.

³Zoran DL. The carnivore connection to nutrition in cats. *JAVMA*. 2002;221:1559-1567.

⁴Kienzle E. Carbohydrate metabolism of the cat. 2. Digestion of starch. *J Anim Physiol Anim Nutr*. 1993;69: 102-114.

⁵Morris JG, Trudell J, Pencovic T. Carbohydrate digestion by the domestic cat (*Felis catus*). *Br J Nutr*. 1977;37:365-373.

⁶De-Oliveira LD, Carciofi AC, Oliveira MCC, et al. Effects of six carbohydrate sources on cat diet digestibility and postprandial glucose and insulin response. *J Anim Sci*. 2008; 86:2237-2246.

⁷Gross KL, Yamka RM, Khoo C, et al. Macronutrients. In: Hand MS, Thatcher CD, Remillard RL, et al., eds. *Small Animal Clinical Nutrition*. 5th ed. Topeka, KS: Mark Morris Institute; 2010:49-105.

⁸Buffington C. Dry foods and risk of disease in cats. *Canadian Vet J*. 2008;49:561-563.

Organic/Natural/Holistic

DEFINITIONS

ORGANIC

Grown with only animal or vegetable fertilizers, such as manure, bone meal compost, etc. According to the U.S. Department of Agriculture (USDA) and Agriculture and Agri-Food Canada (AAFC) rules, the term “organic” may only be applied to pet food labels that meet regulations.

NATURAL

1. Of or arising from nature; in accordance with what is found or expected in nature.
2. Produced or existing in nature; not artificial or manufactured. According to the Association of American Feed Control Officials (AAFCO), the term “natural” requires a pet food to consist of only natural ingredients without chemical alterations.

HOLISTIC

There is no legal definition of this term under laws devoted to pet foods. Any manufacturer can make claims of “holistic” in literature and brochures regardless of ingredients chosen.



Organic/Natural/Holistic *continued*

NATURAL VS. ORGANIC

MYTH Natural means organic.

TRUTH Natural and organic are not interchangeable.

Other truthful claims, such as free-range, hormone-free, and natural, can still appear on food labels. However, do not confuse these terms with “organic.” Only food labeled “organic products” has been certified as organic in accordance with USDA and AAFCO regulations.

Under the new regulations, four categories were created for the term “organic”:



100 PERCENT ORGANIC	ORGANIC	MADE WITH ORGANIC	
<p>May carry new USDA Organic Seal.</p>	<p>At least 95% of content is organic by weight (excluding water and salt) and may carry the new USDA Organic Seal.</p>	<p>At least 70% of content is organic and the front product panel may display the phrase “Made with Organic” followed by up to three specific ingredients. <i>(May not display new USDA Organic Seal.)</i></p>	<p>Less than 70% of content is organic and may list only those ingredients that are organic on the ingredient panel with no mention of organic on the main panel. <i>(May not display new USDA Organic Seal.)</i></p>

By-products

DEFINITION

BY-PRODUCT

Secondary products produced in addition to the principle product, according to the *AAFCO Official Publication 2008*.

BY-PRODUCTS AS INGREDIENTS

MYTH Pet foods containing ingredients listed as “by-products” are inferior.

TRUTH By-products are common ingredients in both human and pet food. A by-product is simply something produced in the making of something else.



When processing **SOYBEANS**, for example, the by-product vitamin E is produced.

MIXED TOCOPHEROLS

(such as vitamin E), used as natural preservatives in pet foods, are by-products of the soybean industry.



VEGETABLE OILS (such as flaxseed oil, rice bran oil, corn oil and soy oil) are by-products extracted from the seeds that are processed for consumption purposes.



CHICKEN FAT is a by-product of the chicken industry.

By-products *continued*

BY-PRODUCTS AS INGREDIENTS (CONTINUED)



PORK, CHICKEN and **BEEF LIVER** are internal organs of animals used for human consumption



BEET PULP is dried residue from sugar beets



TOMATO POMACE comes from tomato skins, pulp and seeds

QA

What do vitamin E, Jell-O® brand gelatin, beef bouillon and lamb meal have in common?

They're all by-products!

Preservatives

DEFINITION

PRESERVATIVE

Having the quality of preserving — n. anything that preserves; esp., a substance added to a food to keep it from spoiling.

A WORD ABOUT PRESERVATIVES

Preservatives are ingredients used in pet food to prevent spoilage and rancidity.

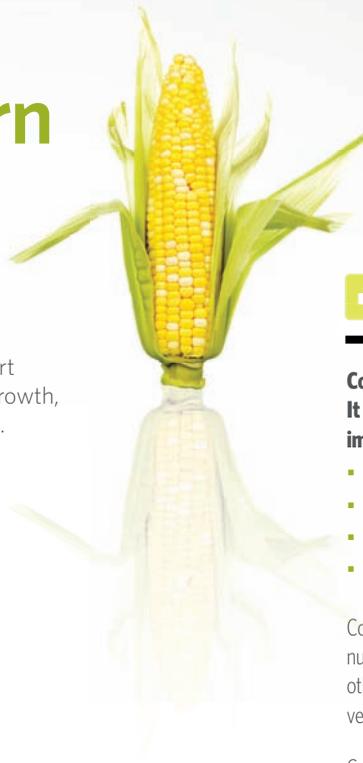
Here are the facts about preservatives commonly found in commercially manufactured pet foods:

- Natural preservatives include tocopherols (vitamin E), spice extracts and citric acid.
- Antioxidant preservatives function to stabilize fats and fat-soluble vitamins against oxidation, which leads to rancidity and loss of nutritional value.
- BHA and BHT are examples of synthetic antioxidant preservatives. Many human foods, such as bread, cheese, margarine, potato chips, meat, and frozen and dried fruits, contain BHA and BHT.





Truth about Corn

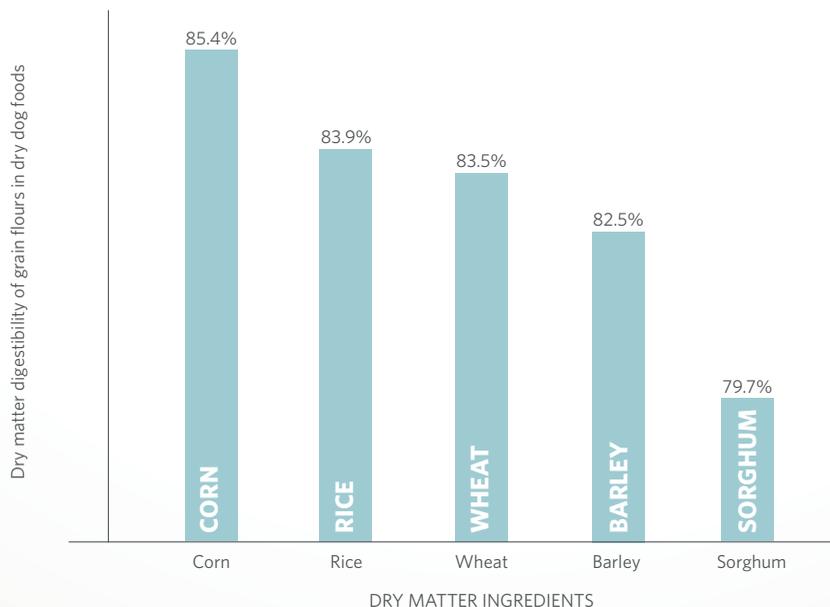


DEFINITIONS

NUTRIENT A substance that must be consumed as part of the diet to provide a source of energy, material for growth, or substances to regulate growth or energy production.

FILLER A food ingredient that supplies no nutrients and serves no nutritional purpose.

Corn is highly digestible¹



▶ AT A GLANCE

Corn is not a filler. It delivers several important nutrients:

- Protein
- Antioxidants
- Fatty acids
- Carbohydrates

Corn is a well-rounded nutritional package. No other ingredient is as versatile.

Corn is safely and easily digested by pets.

Corn is not a common cause of food allergies in pets.

Truth about Corn *continued*

CORN MYTHS

MYTH Corn is a filler.

TRUTH Corn has been called a filler ingredient, but that is inaccurate. Fillers are ingredients that provide no nutrients. Corn supplies many essential nutrients including protein, carbohydrate, fatty acids and antioxidants.

MYTH Corn is a “hot grain” (causes gastrointestinal upset).

TRUTH Corn is not a hot grain for pets; it can be safely and easily digested. Most grains are poorly digested before they are cooked, but like other grains, corn becomes highly digestible after grinding and cooking so nutrients are easily absorbed.⁴⁻⁶ In fact, the protein in corn is more digestible than that of rice, wheat, barley or sorghum.¹

MYTH Corn is a major cause of allergies.

TRUTH It's a misconception that corn is a major allergen for cats and dogs. Corn is NOT a common cause of adverse or allergic food reactions in pets. Corn is implicated in fewer allergy cases than other common protein sources such as beef, dairy products, wheat, chicken, egg, lamb or soy.⁷

A CLOSER LOOK

PROTEIN No single ingredient provides the best protein balance for pets; the best balance comes from a combination of ingredients. The protein building blocks in corn are essential for pets and complement those in other ingredients to provide balanced protein nutrition.

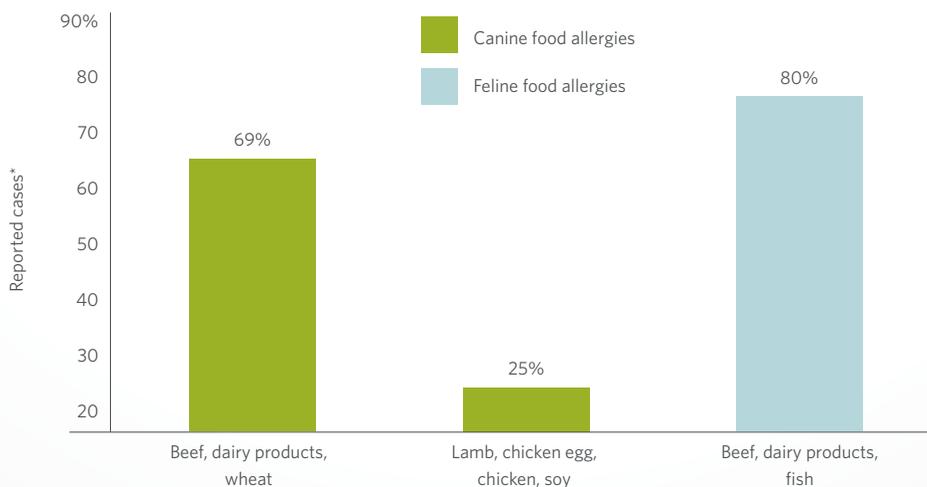
Truth about Corn *continued*

ANTIOXIDANTS Beta-carotene, vitamin E and lutein are antioxidants in corn that help protect key cell components from damage.³

FATTY ACIDS Corn is a rich source of fatty acids, especially linoleic and linolenic for healthy skin and coat. These essential fatty acids also serve important roles in the immune system and central nervous system.³

CARBOHYDRATE The carbohydrates supplied by corn are an important source of energy for pets.

Corn is not an ingredient commonly associated with adverse food reactions²



**Data from cases reported in North America, Europe, Australia, Japan and New Zealand. Common food allergens may differ in other geographic locations.*



FOOTNOTES

- ¹ Murray SM, Fahey GC, Merchen RN, et al. Evaluation of selected high-starch flours as ingredients in canine diets. *J Anim Sci*. 1999;77:2180-2186.
- ² Roudebush P, Guilford WG, Jackson HA. Adverse reactions to food. In: Hand MS, Thatcher CD, Remillard RL, et al., eds. *Small Animal Clinical Nutrition*. 5th ed. Topeka, KS: Mark Morris Institute; 2010:609-635.
- ³ Watson SA, Ramstad PE, eds. *Corn: Chemistry and Technology*. St. Paul, MN: American Association of Cereal Chemists, Inc.; 1987.
- ⁴ Walker JA, Harmon DL, Gross KL, et al. Evaluation of nutrient utilization in the canine using the ileal cannulation technique. *J Nutr*. 1994;124:2672S-2676S.
- ⁵ Schunemann C, Muhlum A, Junker S, et al. Prececal and postileal digestibility of various starches in the dog and pH values and concentration of organic acids in colonic chyme and feces. *Adv Anim Physiol Nutr*. 1989;19:44-57.
- ⁶ Kienzle E. Carbohydrate metabolism of the cat. 1. Activity of amylase in the gastrointestinal tract of the cat. *J Anim Physiol Anim Nutr*. 1993;69: 92-101.
- ⁷ Roudebush P. Ingredients associated with adverse food reactions in dogs and cats. *Adv Sm Anim Med Surg*. 2002;15(9):1-3.

AAFCO Standards

AAFCO stands for Association of American Feed Control Officials. This organization sets the nutritional standards for pet foods sold in the United States. These standards are also recognized in Canada. The nutritional adequacy of pet foods is generally determined by one of two methods based on nutritional levels and procedures defined by AAFCO:

Formulation method

- This method is less expensive, and results are determined more quickly because actual feeding or digestibility trials are not required.
- There is no guarantee of pet acceptance or nutrient bioavailability when utilizing this method.

LABEL EXAMPLE: *Brand X Cat Formula is formulated to meet the nutritional levels established by the Association of American Feed Control Officials Cat Food Nutrient Profiles for Maintenance.*

Feeding trial method

- This method is also known as the “gold standard” for determining nutritional adequacy. The manufacturer must perform an AAFCO protocol feeding trial using the food being tested as the sole source of nutrition.
- Feeding trials are the best way to document how a pet will perform when fed a specific food.

LABEL EXAMPLE: *Animal feeding test using AAFCO procedures substantiate that Brand Y Adult dog food provides complete and balanced nutrition for maintenance of adult dogs.*



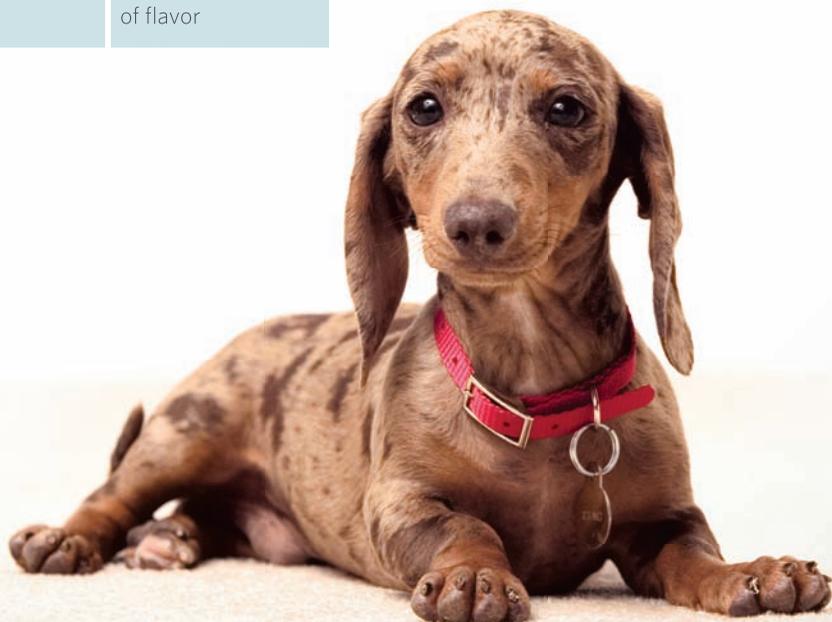
All pet foods must include the following on their pet food label:

- Product name and brand name
- Species name or specialty pet for which the food is intended
- Quantity statement
 - Net weight
- Guaranteed analysis
- Ingredient statement
- Nutritional adequacy or purpose statement
- Feeding directions
- Name and address of manufacture or distributor

AAFCO Standards *continued*

AAFCO requirements for naming pet foods

IF PET FOOD NAME SAYS ...	PET FOOD MUST CONTAIN AT LEAST % OF NAMED INGREDIENT
Chicken, beef, seafood, etc. <i>(ingredient without modifiers)</i>	95%
Dinner, entrée, platter, etc. <i>(chicken dinner, beef entrée, seafood and beef platter)</i>	25%
With <i>(with chicken, with beef, with seafood etc.)</i>	3%
Flavor <i>(chicken flavor, beef flavor)</i>	No specific %, but ingredient list must disclose source of flavor



Understanding the Label

GUARANTEED ANALYSIS

- Gives minimum and maximum for protein, fat, fiber and moisture. It does not give the true amount of the nutrient. Looking at the actual nutrient content of the manufacturer is a better way to evaluate the food.
- Required on the pet food bag:
 - Protein > Minimum
 - Fat > Minimum
 - Fiber > Maximum
 - Moisture > Maximum

INGREDIENT STATEMENT

- Ingredients are listed in descending order by their predominance by weight according to the product's formula. The nutrient value of ingredients cannot be identified from the ingredient statement.

Chicken By-Product Meal, Brewers Rice, Corn Gluten Meal, Animal Fat (preserved with mixed tocopherols and citric acid), Powered Cellulose (11.1% source of fiber), Ground Whole Grain Corn, Chicken Liver Flavor, Soybean Oil, Potassium Chloride, Calcium Sulfate, Choline Chloride, vitamins (L-Ascorbyl-2-Polyphosphate (source of vitamin C), Vitamin E Supplement, Niacin, Thiamine Mononitrate, Vitamin A Supplement, Calcium Pantothenate, Riboflavin, Biotin, Vitamin B12 Supplement, Pyridoxine Hydrochloride, Folic Acid, Vitamin D3 Supplement), Vitamin E Supplement, DL-Methionine, Calcium Carbonate, Taurine, Iodized Salt, minerals (Ferrous Sulfate, Zinc Oxide, Copper Sulfate, Manganous Oxide, Calcium Iodate, Sodium Selenite), preserved with Mixed Tocopherols and Citric Acid, Beta-Carotene, Rosemary Extract.

Understanding the Label *continued*

NUTRITIONAL ADEQUACY STATEMENT

- Foods can be formulated or tested
- AAFCO lifestages
 - Growth-gestation and lactation
 - Adult
 - All lifestages
- Examples

Animal feeding tests using AAFCO procedures substantiate that (Brand Y dog food) provides complete and balanced nutrition for all lifestages.

(Brand Z dog food) is formulated to meet the nutritional levels established by the AAFCO Dog Food Nutrient Profiles for adult maintenance.



Understanding the Label *continued*

DRY MATTER BASIS VS. AS FED

The best way to compare foods is dry matter basis (DMB). Looking at the DMB helps us to understand what specific nutrients are in a product.

To convert a food from “as fed” to DMB:

- FIRST: Subtract 100 by the moisture content
 - EX: $100\% - 75\% \text{ moisture} = 25\% \text{ DMB}$
 - EX: $100\% - 10\% \text{ moisture} = 90\% \text{ DMB}$
- SECOND: Divide the nutrient by the DMB
 - EX: $10\% \text{ protein, as fed} / 25\% \text{ DMB} = 40\% \text{ protein}$
 - EX: $18\% \text{ protein, as fed} / 90\% \text{ DMB} = 20\% \text{ DMB}$

ASH CONTENT

- Ash is the total mineral element of the formula
- Ash is the sum of:
 - Calcium
 - Phosphorus
 - Magnesium
 - Potassium
 - Sodium
 - Etc.
- The ash is the material that remains after combustion of hydrolysis of the organic material





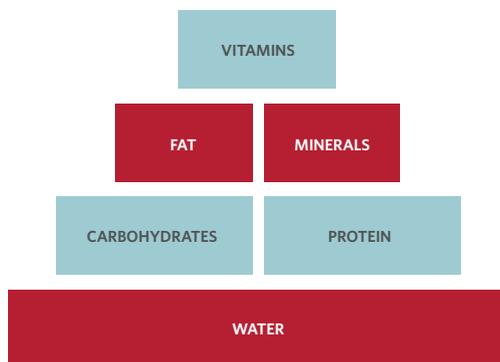
Ingredients and Nutrients

DEFINITIONS

INGREDIENT The means to achieve the nutritional and palatability goals of a food product.¹ An ingredient may supply many nutrients, or none.

NUTRIENT A substance that must be consumed as part of the diet to provide a source of energy, material for growth, or substances to regulate growth or energy production.

The 6 key nutrients



PRINCIPLES OF QUALITY NUTRITION

The optimal nutrient blend is the result of quality ingredients that are formulated with these principles in mind:

- Ingredients should be selected for nutrients, quality and taste
- A balance of quality ingredients delivers protein, fat, carbohydrates, fiber, vitamins and minerals to meet a pet's nutritional needs
- No single ingredient makes a food better or worse; a pet food is the sum of its parts

THE FUNCTIONS OF FOOD

Ingredient functions¹

- Supply nutrients
- Make nutrients palatable

Nutrient functions^{2,3}

- Serve as structural components
- Facilitate metabolism
- Transport substances into, through and out of the body
- Maintain body temperature
- Supply energy

Ingredients & Nutrients *continued*

A CLOSER LOOK

Pet food nutrients, health benefits and ingredients

NUTRIENTS & BENEFITS	INGREDIENTS
Carbohydrates for energy and other nutrients for healthy skin and coat	Corn • Rice • Barley • Sorghum
Fats and essential fatty acids for energy, improved taste, and healthy skin and coat	Animal fat • Fish oil • Vegetable oil
High-quality protein for muscle tone and development, and for healthy skin	Fresh meat • Chicken • Poultry by-product meal • Meat by-products • Soybean meal • Egg
Fiber sources that promote intestinal tract health; some are helpful in weight management	Cellulose • Soybean mill run • Beet pulp

INGREDIENT MYTHS

MYTH Corn is a filler.

TRUTH A filler is a food ingredient that supplies no nutrients. Corn supplies several valuable nutrients including protein, carbohydrate, fatty acids and antioxidants.

MYTH By-products are low quality ingredients.

TRUTH A by-product is simply “anything produced in the course of making another thing.”⁴ When processing soybeans, for example, the by-product vitamin E is produced; other examples of by-products in food are vegetable oils, beef bouillon and gelatin. By-products are common ingredients in both human and pet food.

Ingredients listed on pet food labels as meat by-products include organ meats such as liver and kidney, which have excellent nutritive value.⁵

MYTH Reading the ingredient list is the best way to assess the suitability of a pet food.

TRUTH Appropriate amounts of precisely formulated nutrients are just as important as ingredients.

FOOTNOTES

¹ Crane SW, Cowell CS, Stout NP, et al. Commercial pet foods. In: Hand MS, Thatcher CD, Remillard RL, et al., eds. *Small Animal Clinical Nutrition*. 5th ed. Topeka, KS: Mark Morris Institute; 2010:157-190.

² Gross KL, Yamka RM, Khoo C, et al. Macronutrients. In: Hand MS, Thatcher CD, Remillard RL, et al., eds. *Small Animal Clinical Nutrition*. 5th ed. Topeka, KS: Mark Morris Institute; 2010:49-105.

³ Wedekind KJ, Yu S, Kats L, et al. Micronutrients: minerals and vitamins. In: Hand MS, Thatcher CD, Remillard RL, et al., eds. *Small Animal Clinical Nutrition*. 5th ed. Topeka, KS: Mark Morris Institute; 2010:107-148.

⁴ Webster's New World College Dictionary. 4th ed. Cleveland, OH: Wiley Publishing, Inc.; 2002:201.

⁵ Roudebush P, Dzanic DA, Debraekeleer J, et al. Pet food labels. In: Hand MS, Thatcher CD, Remillard RL, et al., eds. *Small Animal Clinical Nutrition*. 5th ed. Topeka, KS: Mark Morris Institute; 2010:191-206.

Alternative Foods

With all the information available regarding raw foods, via the internet and other sources, it is important for pet owners to be aware of the facts if they are considering an alternative food for their pet.



BONES AND RAW FOOD (BARF) FORMULA

- The BARF formula consists of a combination of raw meat, eggs, meaty bones and vegetables.
- There is no scientific data to support some beliefs commonly held by BARF supporters.
- Some published BARF recipes contain deficient and excessive levels of Key Nutritional Factors such as protein, calcium and phosphorus for an adult dog or cat.¹
- Food poisoning and bacterial contamination are obvious safety hazards not only for pets, but also for humans handling raw foods.^{2,3}
- Pets eating a BARF diet or other raw food formulas are at an increased risk for intestinal obstruction, fractured teeth and gastrointestinal perforation.⁴

Alternative Foods *continued*

HOMEMADE FOODS

- In one study, 90% of homemade pet foods were found to be nutritionally unbalanced and incomplete for pets.⁵
- Pet owners and pets may be exposed to dangerous bacteria, such as salmonella and listeria, harbored by raw or insufficiently cooked meat.⁵
- Pet owners might assume dogs and cats require the same nutrition as humans and provide improper levels of multiple nutrients.⁵
- Homemade meals can contain an inverse calcium and phosphorus ratio dangerous to pets.⁵

FOOTNOTES

¹ Billinghurst I. *Give Your Dog a Bone*. Alexandria, Australia: Bridge Printery; 1993.

² Freeman LM, Michel KE. Evaluation of raw food diets for dogs. *J Am Vet Med Assoc* 2001; 218:705-709.

³ Hand MS, Thatcher CD, Remillard RL et al. In: Food Safety. Miller EP, Cullor JS eds. *Small Animal Clinical Nutrition*. 4th ed. Topeka, KS: Mark Morris Institute; 2000:184-198.

⁴ Joffe DJ, Schlesinger DP. Preliminary assessment of the risk of salmonella infection in dogs fed raw chicken diets. *Can Vet J* 2002; 43(6):441-442

⁵ Hand MS, Thatcher CD, Remillard RL et al. In: Making Pet Foods at Home. Remillard RL, Paragon BM, Crane S et al., eds. *Small Animal Clinical Nutrition*. 4th ed. Topeka, KS: Mark Morris Institute; 2000:169-170.





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Nutrition REFERENCE MANUAL

