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Pet Nutrition

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The Evolution of Dog and Cat Diets

Dogs are omnivorous in the wild, and prefer to eat organs which often contain plant material. They are scavengers and opportunistic predators whose anatomy has evolved to consume a variety of foods (i.e., cutting teeth, grinding teeth, a stomach that can expand tremendously for 1-2 meals, a long intestinal tract ideal for a diet that needs intermediate digestion).

Cats are strictly carnivorous, meaning they must consume animals. They require preformed Vitamin A, taurine, arachidonic acid , niacin, a high amount of Vit B6, and Vit D, all of which they can not form in their bodies and must get from animal sources. They have a limited ability to digest large amounts of simple carbohydrate (COH), but have a protein requirement twice that of dogs.

Wild dog/cat diets are relatively boring. Flavor variety is mostly a marketing concept. Palatability can be increased for dogs by additives such as digested animal tissue, salt, fat, sugar, cheese, vegetable powder, blood and feather meal, or artificial flavor (bacon, hickory smoke).

Food preferences (in taste comparison):

Dogs/cats prefer…	Over
High moisture content foods	Low Moisture foods
Meat based food	Cereal based foods
Cooked meats	Fresh meats
Foods served at body temperature	Very hot or very cold foods
Cooked cereal starches (and easier to digest)	Raw cereal starches
Dogs- beef, pork, lamb, fish	Chicken or liver
Cats- liver, fish	Muscle, over lung. Also don't like plant flavored, powdery, sticky, sugary, or greasy foods.

Feeding a variety of foods when young will increase the ability to accept new foods later in life. Feeding at a regular time interval and place will also decrease finicky behavior.

Reading Pet Food Labels- Take it All with a Grain of Salt

The American Association of Feed Control Officials (AAFCO) is the group that has developed protocols for testing nutritional adequacy of pet foods, as well as a nutrient profile for maintenance, and one for growth/reproduction. Most food companies follow their label guidelines. The FDA, the Center for Veterinary Medicine (an FDA subdivision), the USDA, and the National Research Council (a private non profit) are all involved in various aspects of pet food labeling and manufacturing. Most states follow AAFCO regulations, and in most states, the State Department of Agriculture, Regulatory Protection Division, or State Chemist is responsible for adopting and enforcing pet food regulations.

The "principal display panel" of the pet food package must include the product name, of which the description follows AAFCO regulations.

For Example:	"Beef **for** dogs/cats or Beef Dog/Cat **Food**"	beef ingredients at least 95 % of the total product, excluding water
	"Beef **dinner/supper/recipe/formula**"	beef ingredients at least 25% of total product
	"Dog/cat food **with** Beef"	beef ingredients at least 3% of total product
	"Beef **flavored** Dog Food"	enough beef or extract to provide flavor

The nutritional adequacy statement on the "information panel" explains that a food meets either an AAFCO nutrient profile or passes a feeding trial. AAFCO nutrient profiles (for growth/reproduction and maintenance) are based on calculations of nutrients, but do not specifically reflect nutrient availability or taste. AAFCO feeding trials are more costly, and conducted on living animals. They help avoid nutrient deficiencies, but may not detect nutrient excess.

The "information panel" will also list ingredients in order of descending weight. Misrepresentations of the ingredients can occur when grains are weighed dry, but meat is weighed when still moist. This gives the appearance that there is more meat than grain in the product. The names of the ingredients must conform to AAFCO definitions. Corn=ground corn=corn meal=whole ground corn. However, corn ≠ corn bran ≠ corn gluten meal (low protein) ≠ corn starch ≠corn oil.

"Chicken" = skin and flesh, +/- bone, **not** feathers, heads, feet, or entrails

"Beef" = muscle, i.e., skeletal muscle, heart, tongue, diaphragm, esophagus +/- overlying skin and fat and accompanying vessels and nerves

"Chicken/Beef By-Products"= often internal organs not eaten by humans, blood, bone, **not** horns, hooves, hair, teeth, feathers. Can include poorly digestible parts, like connective tissue and tendons

"Chicken/Beef Meal" = ground "chicken" or "beef" as described above

Some low quality meat suppliers will include parts from animals that were diseased, dying, down, or dead (with the visibly diseased part removed).

The Guaranteed Analysis includes the minimum % for crude protein and fat and maximum % for crude fiber and moisture. Often the true amount will vary slightly from the labeled %.

Crude Protein- estimated by measuring nitrogen. Indicates quantity but NOT quality or digestibility.

Crude Fat- total lipid content. Estimates energy density.

Crude Fiber- often underestimates the true level of fiber

Moisture- does not distinguish between added water and water in ingredients.

The percent COH is not included, but can be estimated by adding up the above 4 listed percents and subtracting from 100.

To compare the composition of different foods, you must make calculations to account for moisture…. to compare apples to apples (and not just look at the % on the package):

% Dry Matter (DM) of a food = **100 % - % moisture**

Specific nutrient as a % Dry Matter= **% Nutrient as labeled ÷% total DM** (previous calculation) in food **X 100**.

A calorie statement is not required. Foods listed as complete and balanced must give feeding directions on the label, which often requires individual variation. Foods that are labeled for "all life stages" contain enough nutrition to provide for the most demanding life stages (i.e., growth and lactation). Such a food will often have excess nutrients for adults or seniors and therefore the amount fed should be less than is labeled. The term "natural" is not legally defined or regulated.

Generally it is assumed to mean free of artificial preservatives and colors. The freshness date, date of manufacture, UPC or barcode is not required.

Nutrient Requirements and Prevention of Diseases

When analyzing a food's nutrients, it's important to understand the animal's physical needs. Excess protein for dogs is **not** beneficial, and could be detrimental for the kidneys. Fat is an important carrier for many vitamins (A, D, E, K). Essential fatty acids are important for normal skin, coat, and anti-inflammatory effects. It's very important to have adequate amounts of calcium and phosphorous but there should **not** be more phosphorus than calcium (which could accelerate kidney disease).

Growing dogs require a fat level, protein level and calorie requirement that is about twice that of an adult until they have reached ½ of the adult weight. They also require slightly higher calcium and phosphorus levels, esp. large breed puppies. However, overfeeding of calories to large breeds can lead to rapid growth and is linked to orthopedic diseases (i.e., hip dysplasia, panosteitis). Senior dogs (those at least half of their life expectancy) should be evaluated closely for energy needs. Those tending towards obesity need less energy, but those who are underweight and very old may require more energy/fat. It may be very helpful to reduce phosphorus to reduce the severity of kidney disease if present. Protein should be very high **quality** and digestible. Constipation can be alleviated by adding fiber.

Obesity is the #1 disease of pet animals which can be prevented by owners. It has been linked to many conditions, including arthritis, respiratory disease, and diabetes. Neutered/spayed dogs will have a lower energy requirement, often are less active than intact animals, and will require a more limited caloric intake to prevent obesity. There are also breed differences in energy requirements. Other factors: age, stress, housing, temperature. All of these factors lead to a tremendous variation of need between dogs. Feeding instructions are estimated to provide enough energy for eating, sleeping, going outside for the bathroom, and up to 3 hrs of play a day, and this amount is usually an overestimation for the average pet. It is generally ideal to feed a food that meets that animal's specific age over one that is formulated "for all life stages" which may have excess nutrients for adults. Obese dogs need increased fiber and lower fat, or sometimes just reduced calories (amount fed). Often pets that are overfed will appear picky when in reality they are trying to self-regulate their intake.

Growing kittens have an energy need about twice that of the adult. Free choice feeding is preferred for kittens under 4-5 months of age. Adult cats will require a relatively high protein level, and moderate fat. Calcium should always be fed at a higher ratio than phosphorus. Feeding methods (free choice or meal time) must be individualized. Senior cats that appear healthy (based on vet exam, urinalysis, and blood work, etc) should not have protein restricted, but may need lower levels of fat to prevent obesity. Senior cats with kidney disease should **not** have a high protein (and P) diet, but may benefit from added water in the food. Obese cats can benefit from a diet high in protein and low in COH. This allows more efficient energy metabolism and decreases pancreas inflammation, therefore lowering risk for diabetes.

Examples of diseases managed by nutrition:

Food allergy	(restrict certain proteins, grains, preservatives)
Urate stones in Dalmatians	(restrict certain purines/proteins)
Gluten sensitivity in Wheaton Terriers	(gluten free food)
Chronic renal disease in dogs/cats	(phosphorus restriction, reduced protein)
Diabetes mellitus in cats	(high protein, low COH diet)
Obesity in dogs	(reduced calories or increased fiber in dogs)

Feeding Options

Commercial dog and cat diets are generally more nutritionally balanced for the dog or cat than most human diets are for people. Regardless of the food used, it's important to remember feeding cost is directly related to the *energy* provided per cup of food. (Rather than price of a cup of food….the higher amount of useable energy per cup of food, the less you have to feed). As a bonus, the higher the digestibility of a food, the smaller the stools!

Canned foods in general have a low caloric density (since high moisture) but have relatively high protein, P, Na, and fat.

Dry foods have higher caloric density (since low moisture) and are lower in protein, fat and minerals. Carbohydrates help them keep their formed pellet shape.

Semi moist foods are very palatable and will have higher sugar, and low fiber, making them unsuitable for diabetes or weight control, and often contain preservatives.

Generic foods are generally sold with white/yellow packaging and black letters. They are often produced locally, with low quality ingredients, in order to keep cost low- and are not from premium manufacturers. Nutritional deficiencies can occur with such food.

Grocery brands (such as Iams or Purina) are moderately priced, often formulated for all life stages, and highly marketed.

Specialty (or Premium) foods are only found at pet stores or vet hospitals (such as Science Diet, Royal Canine, Eukanuba). These foods emphasize higher quality ingredients.

Private Label brands can range from low cost and presumed low cost formulations (i.e. Sam's Club dog food), to premium costs and presumbably more superior ingredients (such as Wellness, Evo).

Veterinary Theraputic foods (such as Purina D/M, Hill's K/D) are formulated with very specific nutrient profiles to be used with specific medical conditions. These are only sold in vet clinics so that their use is under veterinary guidance and supervision.

Homemade Diets- many books, nutritionists, and resources are available to provide balanced recipes (www.balancit.com, www.petdiets.com). It is imperative that recipes are closely followed, since they are more at risk of being either nutrient deficient or excessive than commercial diets. A veterinary exam and screening tests are critical, and should be performed every 6 months.

Raw Diets- can be homemade, bought as frozen, or as dehydrated. Commercial raw diets should ideally be formulated to pass nutritional feeding trials (over profiles). Zoonotic risks are a concern, strict home hygiene practices must be followed, and regular vet exams and tests performed every 6 months.

Raw Diets: Pros & Cons- Is There a Happy Medium?

Pros

Less Processed: (Presumed benefits of better health, less chronic disease) The higher temperature a food is processed, the less bioavailability some amino acids in the protein. Most dry pet foods are extruded, meaning they are rapidly cooked using high pressure and temperature, then instantly dried and cut. Most canned foods undergo some type of processing in a pressure cooker. Vitamins, enzymes, and antioxidants contained within such food are often destroyed by heat, pressure, humidity, and oxygenation. Some of these are compensated by spraying them on prior to packaging. Raw food presumably contains more of these in a natural state.

Cons

Less Processed: Some ingredients are more beneficial when cooked (i.e. lycopene-tomatoes).

Contamination: Can contain Salmonella, pathogenic E. coli, and similar bacteria. Dogs are more resistant to an infection, since their acidic stomach often kills such bacteria. However pets can be a source of infection to people either through their saliva or shed through feces. At serious risk are very young, very old, and immune compromised people or pets. Of course strict home

hygiene must be practiced with all raw foods- wash bowls thoroughly and often, keep animals and bedding clean, do not spread contamination to human foods, esp. those not cooked.