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Nutrition

Compared to humans, the cat's sense of taste is far less refined. We have 9,000 taste buds, while cats have only 473. These special mushroom-shaped papillae are present at the tip and sides of the tongue. A set of cup-shaped papillae are located at the back of the tongue.

Cats are responsive to the basic tastes of sour, bitter, and salty. Recent studies have shown that cats cannot taste sweet things at all. As strict carnivores, there really is no need for them to respond to sweet tastes.

The rough, prickly feline tongue is covered with tiny hooklike barbs. Cats use their tongues to remove feathers or fur from their prey and to lick meat from the bones. They also use them to groom. A cat's tongue mimics a spoon when drinking, enabling her to lap up liquids in quantity, swallowing after every third or fourth lap.

Cats make up for their poor sense of taste with a superior sense of smell. In fact, both senses are registered in the same area of the feline brain. That is why heating food to intensify the aroma may tempt a cat who is not eating well. Food straight from the refrigerator doesn't appeal to cats, whose wild ancestors ate freshly killed prey while it was still warm.

Basic Nutritional Requirements

Cats are obligate carnivores, which means that in the wild, they subsist on a diet that consists only of meat. The ideal natural cat diet, the mouse, is 40 percent protein, 50 percent fat, and only 3 percent carbohydrates. In fact, cats require considerably more protein than dogs do—about two to three times as much. *Never* feed dog food to a cat! The diet will be deficient in many nutrients.

Due to their natural diet and certain enzyme deficiencies, cats are somewhat uniquely adapted to metabolize protein and fat as energy, in preference to carbohydrates. Even when a cat is on a limited protein diet, her body will try to use up all protein first. For this reason, it is easy for a sick cat who is not eating well to quickly become protein deficient. The diet of an adult cat must be at least 26 percent protein. Cats also need adequate fat in their diet. Fat is

used for energy but also for a healthy nervous system, skin, and many metabolic processes. Ideally, a cat's diet should be at least 9 percent fat.

Cats lack many of the amylases, which are enzymes that aid in carbohydrate digestion. Large amounts of carbohydrates may decrease the efficiency of protein digestion as well as cause high levels of blood glucose.

The basic nutritional requirements for cats are listed in the table below. In this table, minimal requirements are the bare minimum amount an average cat needs to stay healthy; adequate intake is the amount that will keep a cat in a healthy state; recommended allowance is the amount suggested to be sure the cat receives adequate nutrients; safe upper limit is the amount not to be exceeded for nutrients (exceeding this amount can cause problems). Not every column has a number because values have not been determined for every nutrient in every category.

The table also refers to metabolizable energy (ME). The ME of a food is the amount of energy available to the cat after the energy required for digestion and absorption is subtracted. If there is a loss of energy because some parts of the food are indigestible, that is also subtracted. So this is the "net" energy available to your cat after she eats the food.

Nutrient Requirements of Adult Cats for Maintenance

Nutrient (amount per kilogram of dry matter food[1])	**Minimal Requirement**	**Adequate Intake**	**Recommended Allowance**	**Safe Upper Limit**
Crude Protein	160		200	
Amino Acids				
Arginine (g)[2]		7.7	7.7	
Histidine (g)		2.6	2.6	
Isoleucine (g)		4.3	4.3	
Methionine (g)[3]	1.35		1.7	
Methionine & Cystine (g)	2.7		3.4	
Leucine (g)		10.2	10.2	
Lysine (g)	2.7		3.4	
Phenylalanine (g)		4.0	4.0	
Phenylalanine & Tyrosine (g)[4]		15.3	15.3	
Threonine (g)		5.2	5.2	
Tryptophan (g)		1.3	1.3	
Valine (g)		5.1	5.1	
Taurine (g)[5]	0.32		0.40	

Nutrient (amount per kilogram of dry matter food[1])	Minimal Requirement	Adequate Intake	Recommended Allowance	Safe Upper Limit
Total Fat (g)		90	90	330
Fatty Acids				
Linoleic Acid (g)		5.5	5.5	55
Alpha-Linolenic Acid (g)				
Arachidonic Acid (g)		0.02	0.06	2
Eicosapentaenoic & Docosahexaenoic Acid (g)[6]		0.1	0.1	
Minerals				
Calcium (g)	1.6		2.9	
Phosphorus (g)	1.4		2.6	
Magnesium (mg)	200		400	
Sodium (mg)	650		680	>15
Potassium (g)		5.2	5.2	
Chloride (mg)		960	960	
Iron (mg)[7]		80	80	
Copper (mg)[7]		5.0	5.0	
Zinc (mg)		74	74	>600
Manganese (mg)		4.8	4.8	
Selenium (µg)		300	300	
Iodine (µg)	1,300		1,400	
Vitamins				
Vitamin A (µg retinol)[8]		800	1,000	100,000[8]
Cholecalciferol (µg)[9]		5.6	7	750
Vitamin E (Alpha-tocopherol) (mg)		30	38	
Vitamin K (Menadione) (mg)[10]		1.0	1.0	
Thiamin (mg) (Vitamin B1)		4.4	5.6	
Riboflavin (mg) (Vitamin B2)		3.2	4.0	
Pyridoxine (mg) (Vitamin B6)	2.0		2.5	

continued

Nutrient Requirements of Adult Cats for Maintenance *(continued)*

Nutrient (amount per kilogram of dry matter food[1])	Minimal Requirement	Adequate Intake	Recommended Allowance	Safe Upper Limit
Niacin (mg) (Vitamin B complex)		32	40	
Pantothenic Acid (mg) (Vitamin B–Coenzyme A)	4.6		5.75	
Cobalamin (µg) (Vitamin B12)		18	22.5	
Folic Acid (µg) (Vitamin B complex)	600		750	
Biotin (µg)[11] (Vitamin B complex)		60	75	
Choline (mg)	2,040		2,550	

Adapted from National Research Council's Nutrient Requirements for Cats. Reprinted with permission from the National Academies Press, Copyright 2007, National Academy of Sciences.

[1] The values for amount per kilogram of dry matter have been calculated assuming a dietary energy density of 4,000 calories ME per kilogram of food. If the energy density of the diet is not 4,000 calories ME per kilogram, then to calculate the per kilogram of dry matter for each nutrient, multiply the value for the nutrient by the energy density of the pet food (in calories ME per kilogram) and divide by 4,000.

[2] 0.02 g arginine should be added for every gram of crude protein above 200 g for the Recommended Allowance of arginine.

[3] Methionine is presumed to be half the sum of the requirement for methionine and cystine combined.

[4] To maximize black hair color, an equal quantity or greater of tyrosine to that of phenylalanine is required.

[5] The recommended allowance of taurine for highly digestible purified diets is 0.4g/kg diet, whereas the allowances for dry expanded and canned diets are 1.0 and 1.7 g/kg diet, respectively.

[6] Includes docosahexaenoic acid only; no information is available on eicosapentaenoic acid. It is advised that eicosapentaenoic acid is included but not to exceed 20 percent of the total eicosapentaenoic plus docosahexaenoic amount.

[7] Some oxides of iron and copper should not be used because of low bioavailability.

[8] One IU of vitamin A is equal to 0.3 µg of all-*trans* retinol or 1 µg retinol =3.333 IU of vitamin A. Safe upper limits values expressed as µg retinol.

[9] 1 µg cholecalciferol = 40 IU vitamin D3.

[10] Cats have a metabolic requirement, but a dietary requirement has not been demonstrated when natural diets (except fish-based diets) are fed. Under most conditions, adequate vitamin K is probably synthesized by intestinal microbes. The vitamin K allowance is expressed in terms of the commercially used precursor menadione that requires alkylation to the active vitamin K.

[11] For normal diets that do not contain raw egg white, adequate biotin is probably provided by microbial synthesis in the intestine. Diets containing antibiotics may need supplementation.

AMINO ACIDS

A cat's diet must contain more than 20 amino acids to be complete. Amino acids are the building blocks of proteins. They must be present in adequate amounts and in just the right balance. Many amino acids can be synthesized in the cat's body. Others, known as the essential amino acids, must be present in the diet.

Cats have 11 essential amino acid requirements: histidine, isoleucine, arginine, methionine, phenylalanine, threonine, tyrptophan, valine, leucine, lysine, and taurine. Although many mammals can convert other amino acids to taurine, cats cannot. Without adequate taurine, cats develop retinal changes leading to blindness and the serious heart condition cardiomyopathy (see page 318). A deficiency of taurine may also cause reproductive problems, including infertility, death of unborn kittens, and birth of fading kittens. Taurine is found in highest concentration in certain seafoods and also in organ meats. Cat foods should contain at least 0.02 percent taurine on a dry matter basis (see page 501 for an explanation of dry matter basis).

Arginine is used in large amounts by cats to process urea. Without adequate arginine, cats show neurological signs from high levels of ammonia in the blood, including tetany or tremors, salivation, vomiting, and coma, often leading to death. Arginine supplements may be needed for cats with hepatic lipidosis.

Cats have high requirements for methionine and cysteine, as these amino acids are converted to glucose and then used to provide energy. Cysteine is also important for hair growth and to provide felinine, which is excreted in urine and may be important for scent marking.

Tyrosine is an amino acid that is conditionally essential for cats; many cats can manufacture enough, but some cats will need to get it from their diet. Tyrosine is important in the production of melanin. A deficiency is primarily noted in black cats, who develop a reddish brown tinge to their hair.

Carnitine is another amino acid that is felt to be conditionally essential in cats. It is synthesized in feline kidneys (not in the liver, as in dogs and humans). It is important for weight loss in cats and also in the treatment of hepatic lipidosis.

VITAMINS AND MINERALS

Cats cannot convert tryptophan to niacin efficiently and may need added pyridoxine (B6) and cobalamin (B12), especially when they are ill or not eating well.

Cats are unable to convert beta-carotene to retinol, which is the active form of vitamin A. They must get vitamin A in the diet—another plus for feeding animal tissues. Vitamin D (calcitriol) is another essential dietary component for cats because they cannot synthesize it (humans synthesize vitamin

D in the skin through exposure to sunlight). Neither of these vitamins should be supplemented without veterinary consultation as overdosing is common and can be toxic.

Calcium deficiency is the most frequent nutritional disorder in cats. It should not occur if the cat is eating a nutritionally balanced diet. It may be brought on by feeding meats exclusively or by lactation that puts an extreme drain on a queen's calcium reserves (see *Eclampsia*, page 448).

Phosphorus is another mineral that must be kept in correct balance with calcium to prevent bone and kidney disorders. The ideal ratio is about 1.2 parts calcium to 1 part phosphorus for adult cats; that's about 0.9 percent calcium to 0.8 percent phosphorus. This ratio changes from kittenhood to adulthood. Growing kittens need about 1.8 percent calcium to 1.6 percent phosphorus in their diet. Cats rarely show a phosphorus deficiency, but excess phosphorus can be related to kidney disease.

Commercial Cat Foods

The commercial importance of cat foods has made the industry a multibillion-dollar business. Accordingly, cat food manufacturers have conducted extensive research and feeding trials to establish nutritious and highly palatable diets that do not require supplements.

Your cat's overall condition—haircoat, weight, activity level, and so on—are all influenced by her diet. If any of these seems less than optimum, a poor diet may be the culprit. You can also gauge the effectiveness of a product by observing its effect on your cat's stool. Poor quality protein passes through a cat's intestinal tract unused, resulting in loose or mushy stool, or diarrhea. Very large stools, or large amounts of stool, on the other hand, indicate excessive amounts of fiber and other indigestibles that are not being used by your cat's body.

Commercial foods contain instructions on the label about how much to feed based on the weight of the cat. The manufacturer's recommended serving size is often greater than many cats require. Follow the directions at first, but monitor your cat's weight. Feed more if the cat starts to lose weight and less if she gains weight or leaves food in the dish. Each cat really needs a customized diet based on her size, health, age, and activity.

TYPES OF CAT FOOD

There are three types of cat food: dry, semimoist, and canned. To make meaningful comparisons, all must be compared on a dry matter basis (see page 501). When the water content is factored out and the products compared this way, you'll find that most canned foods contain more all-important

protein than dry or semimoist foods. Another way to compare products is by energy content (calories). Again, factoring out the moisture content, dry food provides far more calories per ounce (28 g) than canned food, which means you would have to feed three to four times more canned food than dry food to provide the same amount of energy.

The value of a cat food depends not only on the form but on the quality of the ingredients used to produce it. Good quality and inferior quality products are available in canned and dry foods. Each has advantages and disadvantages.

Dry Cat Food

All dry foods contain some sort of carbohydrate product that is used to form the kibbles. Often, it's a grain such as wheat, corn, or rice. Grain-free dry foods are also available, but they contain an alternate carbohydrate source, such as potatoes. During processing, dry foods are cooked to 150°F (65.5°C), which breaks down the starch in the cereals, increasing their digestibility. The temperature flash also sterilizes the product and removes most of the moisture.

Dry foods are the least expensive. They can also be left out at all times, enabling the cat to eat at will. This is a more natural way for cats to eat, but may contribute to obesity.

Dry foods are abrasive and help keep the teeth clean and sharp. However, the shearing forces generated when a cat chews dry kibble may also be implicated in feline oral resorptive lesions (see page 243).

A disadvantage of dry food is that palatability may be less than other types. However, most cats accept it well. Dry foods often have 20 percent to 50 percent carbohydrates, so they have less animal tissues. The protein content in some dry foods may not be ideal for cats. It's important to read the labels carefully.

A potential disadvantage of dry food is that the high carbohydrate content has been suggested as a possible predisposing factor in the development of diabetes. Also, because of its lower moisture content, it may predispose a cat to FLUTD. Due to their desert origins, cats drink little water and may not drink until they are 3 percent to 5 percent dehydrated. Cats who eat only dry food are not taking in nearly the amount of fluid that cats eating canned food are. Some cats may need to be encouraged to drink more if they are fed only dry food.

Dry foods tend to lose their nutritional value over time and should not be used after six months of storage.

Semimoist Cat Food

Semimoist foods have more eye and taste appeal to humans, but these come at a price. They are usually loaded with artificial colors and preservatives. They also usually have a high sugar content—which cats do not need and cannot even taste.

Canned Cat Food

It is tempting to think of canned cat foods as being full of cooked meat with some nutritional supplements added in. But the fact is that inexpensive canned foods may have almost as many nonmeat items as dry foods. Not all canned products are complete and balanced foods, either. It's important to read the labels and compare foods on a dry matter basis to choose a good canned food for your cat.

Canned foods contain more water, which may be an important factor in your cat's diet. The premium brands also contain very few or no carbohydrates. They usually contain more fat and therefore more energy. They may be preferred for the energetic cat who will not eat other foods because of taste preference. Canned foods do not reduce dental tartar.

They are not suitable for free-feeding. Once opened, they quickly develop an unpleasant smell that is even more unpleasant for the cat. Canned food should not be left out for more than about 20 minutes. Opened cans of food should be covered and stored in the refrigerator. It will have to be warmed at least to room temperature to be fed.

It is suggested that cats fed from pop-top cans have a five times greater risk of hyperthyroidism. The tops contain bisphenol, a diglycidyl ether, which may be the contributing factor. Cats fed a diet of 50 percent canned food have a 3.5 percent increased risk of hyperthyroidism.

CAT FOOD BRANDS

Commercial cat foods can be classified as generic, popular, and premium. Generic foods are less expensive than popular ones, and premium foods are the most expensive. Generally, you get what you pay for. The premium foods tend to have higher quality proteins and fewer fillers. Cats also need to eat less of these foods, which means they are not as expensive as they first appear. And because they are more nutrient-dense, less ends up in the litter box.

A common misconception is that the protein in dry foods is primarily from grain sources, while the protein in canned foods is all from meat sources. In fact, all varieties contain protein from meats and grains, although canned food usually has the most meat protein. Although nonmeat protein is the least expensive, it is also the least desirable. The cost of the food thus becomes an index of protein quality, with the more expensive cat foods having a greater percentage of their proteins derived from meat products.

Pet food manufacturers sometimes add ingredients to increase palatability—but this may be at the expense of nutritional value. Gourmet foods, in particular, usually contain meat from one specific source, such as tuna, shrimp, chicken, liver, or kidneys. They have excellent palatability and a high protein and fat content, but being from a single source they may not be nutritionally balanced. Usually, these foods must contain other ingredients to be labeled as completed and balanced.

Generic and Private-Label Brands

Generic cat foods do not have a brand name. Private-label pet foods carry the names of the stores in which they are sold. These foods provide a list of ingredients as required by law, but most cannot make claims that the food is nutritionally balanced or complete.

Generic products are less expensive than popular and premium brands, because the food is manufactured using low-cost ingredients. Furthermore, the ingredients vary from package lot to package lot, depending on which nutrient sources were available at the time the food was manufactured. In tests, many of the generic products were found to have lower digestibility, due to the addition of indigestible fibers.

Popular Brands

Popular cat foods are the recognizable brands from major food manufacturers. They are available at most supermarkets and grocery stores. These companies spend a good deal of time and energy testing and advertising their products. However, to keep costs low, they do not contain as much meat as the premium brands. In dry foods, a look at the ingredient lists often reveals a grain source as the first ingredient. If the first ingredient is a meat source, the next several ingredients may all be grains.

Premium Brands

Premium foods are available through veterinarians, specialty pet supply stores, feed stores, and online. In general, the ingredients used in these products are highly digestible and have good to excellent nutrient availability. In contrast to popular brands, premium foods are produced by using fixed formulas. The ingredients used do not fluctuate in response to availability or market price. Manufacturers of these foods validate their claims through AAFCO feeding studies (see page 501).

Because these products contain high-quality food sources that are easily digested, smaller amounts can be fed. Therefore, even though they cost more, the cost per serving may be comparable to many popular brands.

READING THE LABELS

When choosing a cat food, it is important to determine whether it has been formulated to meet all the daily protein, fat, vitamin, and mineral requirements of your cat. The Food and Drug Administration has established very specific guidelines for pet food labeling. All cat food manufacturers provide a list of ingredients in their foods. Ingredients are listed according to amount: the ingredient provided in the greatest amount first, the least amount last. However, the required labels do not contain enough information for you to determine the exact nutrient content of the product. The nutrients must be

converted to dry weight (adjusted for the amount of liquid, see page 501). Also, the true quality of the ingredients is not indicated on the label.

Rules About Names

An ingredient list gives only a rough idea of the quality of the food. For example, protein in cat food is derived from meat, poultry, fish, the by-products and meal of these meat sources, soybean meal, and cereal grains such as corn, wheat, and rice. These various protein sources are not all of the same quality and digestibility. The mere fact that beef or some other protein is mentioned on the label is no guarantee of quality—it may indicate levels as low as 3 percent.

If the product's name contains the words "beef," "chicken," "lamb," "fish," and so on, 95 percent of the dry matter of the product must be derived from that protein source. An example might be "Beef for Cats." In this case, at least 95 percent of the product must be beef, not counting the water added for processing and "condiments." Counting the added water, the food must still be 70 percent beef. Since ingredient lists must be declared in the order of predominance by weight, the beef ingredient is listed first. If the name includes a combination of ingredients, the two together must make up 95 percent of the total weight.

If the product's name contains the word "dinner" (as in "Beef Dinner for Cats"), beef must compose at least 25 percent of the product (not counting the water for processing). Many other words also apply under the "dinner" rule, including "platter," "entree," "nuggets," and "formula." Because, in this example, only one-quarter of the product must be beef, it would most likely be found third or fourth on the ingredient list.

If the product's name contains the word "with," only 3 percent of the product (not counting the water for processing) contains that ingredient. So "Cat Food with Beef" has just 3 percent beef. Under the "flavor" rule, a specific percentage is not required, but a product must contain an amount sufficient to be able to be detected.

Guaranteed Minimums

At minimum, a pet food label must state guarantees for the minimum percentages of crude protein and crude fat, and the maximum percentages of crude fiber and moisture. Some manufacturers include guarantees for other nutrients, as well. The maximum percentage of ash (the mineral component) is often guaranteed on cat foods. Cat foods usually list guarantees for taurine and magnesium as well.

"Crude" refers to the specific method of testing the product, not to the quality of the nutrient itself. So, in fact, these guarantees tell you nothing about the digestibility of the ingredients.

Guarantees are listed on an "as fed" or "as is" basis, which means the amounts present in the product as it is found in the can or bag. This doesn't have much bearing when you are comparing two products with a similar moisture

content. But if you want to compare the guaranteed analyses of dry and canned foods, moisture content matters. Canned foods typically contain 75 percent to 78 percent water, while dry foods contain 10 percent to 12 percent water.

Dry Matter Basis

To make meaningful comparisons of nutrient levels between a canned and dry product, you'll need to convert the guarantees for both products to a dry matter basis. The percentage of dry matter of the product is 100 percent minus the percentage of moisture guaranteed on the label. So if a dry food is 10 percent water, it's 90 percent dry matter (100 minus 10).

To convert a nutrient guarantee to a dry matter basis, divide the percent guarantee by the percentage of the dry matter, then multiply by 100. For example, if a particular canned food is 75 percent moisture, that means it is 25 percent dry matter. If it guarantees 8 percent crude protein, you divide the 8 percent by the 25 percent dry matter to get .32. Multiply that by 100 to get 32 percent dry matter protein.

Complete and Balanced

An important indicator of quality is a statement on the label that says the diet meets the standards set by the Association of American Feed Control Officials (AAFCO), a nonprofit association of federal and state officials that develops guidelines for the production, labeling, and sale of animal foods.

There are two ways a food can meet AAFCO guidelines, and which one the manufacturer uses must be stated on the label. One standard requires that the food meet an AAFCO profile that is based on a calculation of all the nutrients cats are theoretically known to require to maintain health and fitness. The other standard involves feeding tests that show actual cats can live and thrive on the product.

The calculation approach is limited in its usefulness because current knowledge is not complete for all nutrients cats require. In addition, there is no guarantee that the cat can digest and absorb all the nutrients in a specific food. Feeding trials are superior because they show that the product actually works and delivers the desired results. The drawbacks are that only a six-month feeding trial and a small number of test cats are required for a manufacturer to make the claim.

Also look for a statement on the label that describes the product as "complete and balanced." If it does not so state, you can assume it is not a complete diet and you should choose another product. If a food has been formulate to support the growth of kittens (also used for pregnant and nursing queens), the product will be labeled as one that supports growth, is suitable for young kittens, or is suitable for the first year of your kitten's life. To make such a claim on the label, the product must conform to one of the AAFCO profiles for that stage of life. Any food marketed as "for all life stages" must have the extra protein and calories needed to support growing young kittens as well as maintain older cats.

Diets for Health Problems

Great progress has been made in developing diets that are helpful in treating and/or controlling health problems in cats. Many of these are available only by prescription or through your veterinarian. These diets are customized to be ideal for certain health problems, such as allergies and food intolerance, kidney problems, diabetes, and certain types of urinary stones. Do not start your cat on one of these diets without veterinary supervision, as they may cause problems for a cat with normal health.

Raw Diets

Raw diets have become popular recently. These diets stress feeding primarily raw meat along with meaty bones, with some vegetables and supplements mixed in. There are numerous serious problems that can be associated with feeding a diet like this. Getting a correct nutritional balance can be tricky. Raw meats must be handled very carefully to prevent bacterial diseases such as *Salmonella*—which can affect people as well as cats. Careful storage, thawing, and superb hygiene in handling are essential to prevent health problems. Parasites can be a serious problem in raw meat. And muscle meat alone will not be sufficient—cats must also eat organ meats.

Chewing bones could lead to splinters if the cat isn't observed carefully, and most cats cannot ingest the types of meat bones that are available for purchase (remember, in the wild they would eat mice and very small birds). However, a diet without bones is not nutritionally complete.

The average cat owner does not have the time or nutritional background to feed a diet like this successfully and safely. If you choose to go with a raw diet, you need to consult a veterinary nutritionist for guidance. The same rules and need for guidance apply if you choose to cook homemade meals for your cat. You can get balanced diets from a veterinary nutritionist if you wish to cook for your cat.

Feeding Your Cat

Food Preferences

Many owners assume a cat will naturally eat a nutritionally balanced diet if given a variety of foods from which to choose, and will stop eating when she has had enough. This is incorrect. Many cats will starve rather than eat a food they find unappetizing. And many cats will eat out of boredom or enthusiasm until they are dangerously obese.

In general, cats prefer meat—whether cooked or raw makes no difference. They prefer food at body temperature, rather than hot or cold. In the wild, mice are the primary food of cats. Meat alone is not a complete diet, though. If you feed it exclusively, your cat will probably develop a preference for meat and stop eating anything else. These cats will eventually show calcium deficiencies.

Cats may become addicted to single-ingredient foods (such as liver or tuna) if that is all they are fed. These single-source foods are not nutritionally balanced and should not be fed as the only food. However, there is no reason a cat should not develop a preference for a particular product as long as it is nutritionally complete. The problem arises when a cat develops a preference for a food that is not a complete cat food. Canned specialty or gourmet foods, in particular, are highly addictive. At the very least, the cat should be fed a variety of flavors of a single brand.

Another type of food preference occurs when an owner oversupplements an already complete diet with a highly palatable item such as liver, kidneys, milk, eggs, or chicken. The cat then develops a preference for that item and refuses to eat the complete diet. More tidbits are then required and eventually the diet becomes unbalanced.

Many cats develop a liking for liver. Large amounts should not be given because of high concentration of vitamin A, which could produce vitamin A toxicity. Similarly, raw fish and raw eggs should not be given in excess. Both contain antivitamin factors, which bind with vitamins or interfere with vitamin metabolism and could produce a lethal deficiency.

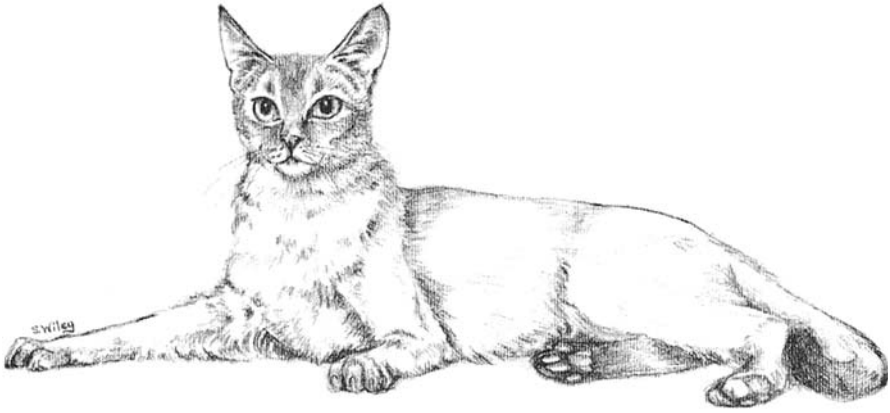
Many cats enjoy milk. How much they can consume without experiencing diarrhea varies greatly with the individual. Some adult cats do not have adequate lactase to digest dairy products without problems. Milk should not sit out for more than two hours—nor should canned food—because of the risk of spoilage.

FEEDING ADULT CATS

The actual amount of food a cat needs varies among cats of equal weight because of differences in metabolic rate and activity level. Labels only provide guidelines—the actual amount to feed must be customized to the individual cat. Spayed and neutered cats have a much lower metabolism than intact cats.

Generally, an active adult cat will need about 30 to 35 calories per pound (.45 kg) of body weight per day, and some will do well with about 25 calories per pound per day. An inactive cat will need about 18 calories per pound (.45 kg) of body weight per day. Even if they are active, many spayed and neutered cats do very well on the lower calorie estimate.

Pregnant and nursing cats have much higher requirements—figure about 45 calories per pound of body weight per day during the last trimester of pregnancy and as high as 140 calories per pound during the peak of lactation.



Body type, activity level, coat, individual metabolism, and a host of other factors affect how much food a cats needs. This lithe, active Abyssinian will need more calories per day than a sedentary, heavy-bodied cat.

The bottom line on feeding requirements is that each cat is an individual. You need to look at your cat objectively and determine the correct amount of food based on her activity level and metabolic rate, as well as the nutrient density of the food you feed her.

Cats vary widely in the amount of food required to maintain normal body weight and should be fed whatever is necessary to maintain the ideal body condition. This means the ribs cannot be seen but are easily felt, and the abdomen is trim but not flabby. Older, sedentary cats require fewer calories than the amounts indicated in the table, while active cats require more. Considerably more food is required for nonmaintenance activities, such as pregnancy and lactation.

Select several nutritionally complete cat foods and offer them one at a time to your cat for several days in succession. Note which ones your cat seems to like best. Having found two or three products acceptable to your cat, use them interchangeably to provide variety and appetite appeal. This is also a good idea in case of food recalls so that your cat will eat another food.

Cats may be fed free choice, where dry food is available at all times, if the cat is active and maintains good body condition. (Canned products should be fed twice a day, at the same time each day, and left out for just 20 minutes. After that, throw away what hasn't been eaten in the cat's dish.) If your cat tends toward obesity, however, food should not be left down free choice. Even dry food can be put out for just 10 or 15 minutes two or three times a day. Here it becomes important to consult page 503 to determine caloric requirements—with a view to keeping the cat healthy and trim.

There are advantages to feeding meals. You will know how much your cat is eating and whether your cat is eating at all. Regular meals give the cat something to look forward to. For a cat on medication, feeding meals makes it

easier to sneak in pills in treats. Cats with health problems such as diabetes may need to be on regimented feeding schedules. Regular meals in a multicat household enable you to monitor and make sure timid cats are not being bullied away from their food. (Of course, each cat must have her own dish.)

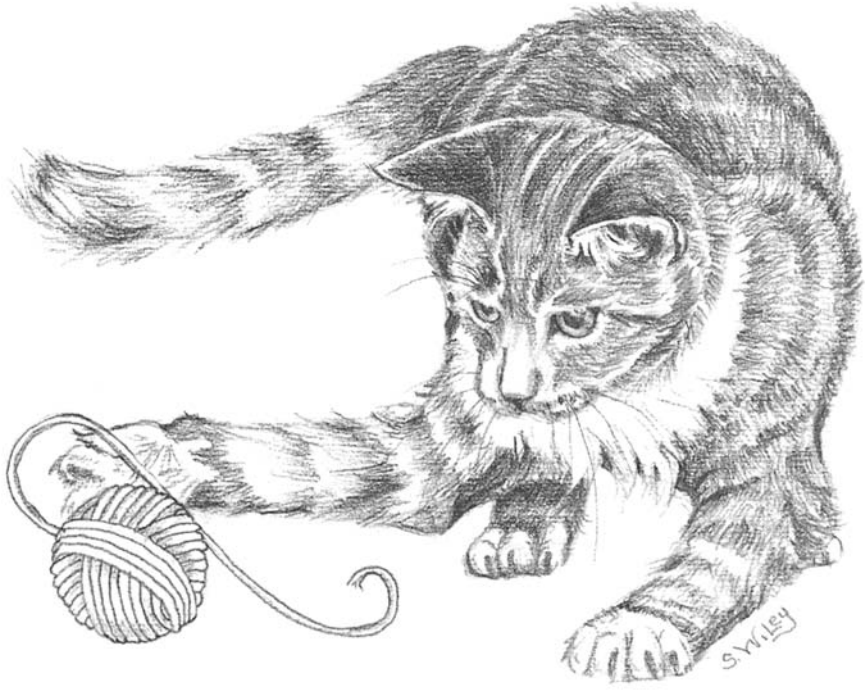
Remember to keep a bowl of clean, fresh water available at all times.

FEEDING KITTENS

When they're first born, kittens basically eat and sleep—and grow. From birth to about 7 weeks old, kittens grow from about a quarter of a pound (113 g) to about 2 pounds (907 g). That means they're gaining half an ounce (14 g) a day. This amazing growth is fueled by their mother's milk.

After that, kitten food takes over as fuel. Kittens need a growth formula food for a simple reason: By the time a cat is 9 months old, she is basically full-grown and sexually mature. It takes humans about 13 years to reach the same level of growth. And it takes a lot of nutrition to make that fast growth possible.

Ten-week-old kittens require about twice as much protein and 50 percent more calories per pound (.45 kg) than do adult cats. At 12 weeks of age, a kitten's energy needs are three times those of an adult cat. The growth rate slows



Fast-growing, energetic kittens need much more protein and fat in their diet than adults need.

by the time the kitten is 6 months old, but she still needs 25 percent more nutrition than an adult cat. High protein and high calories are really important, and kittens who don't get a good start may have health and development problems all their lives. Accordingly, it is important to feed a nutritionally complete diet specifically formulated to support the growth of kittens.

A kitten's body uses protein to build muscles–including heart muscle. Protein also plays an important role in circulation and coat growth. Rapid growth, along with the bursts of energy kittens display, uses up a lot of calories, and that's where the fat comes in—fat is the most concentrated source of calories. Vitamins and minerals are important as well, especially vitamin A, which is critical for growth and metabolism. And water is vital for the health of cells and skin.

If you have purchased a pedigreed cat, the breeder should supply diet guidelines with a new kitten. This should be followed, at least for the first few days, since an abrupt change in diet can cause indigestion.

Labels on cat food packages provide recommended daily feeding amounts. They are useful guidelines but are not applicable to every kitten. As a rule, young kittens should be fed as much as they will eat. They burn calories and absorb nutrients so quickly that it's almost impossible to overfeed them.

Kittens can be fed free choice—which may be preferable when feeding a litter—or they can be fed at specific meal times. Spread their food out over at least three meals a day, because little stomachs can only hold so much at one meal. If you're using canned food, feed three times a day until kittens are 7 months old. Leave some dry kitten food out for snacking, too. However, with the trend toward early neutering, it's important to realize that neutering decreases metabolism by at least 25 percent. This means that standard feeding recommendations may not be correct for a kitten neutered before 6 months of age. You need to check with your veterinarian about correct feeding practices for your kitten.

Kittens tend to gain about 1 pound (.45 kg) a month until they reach 8 to 10 months of age. They should stay on kitten food until about 1 year. Growth slows down a bit at 6 months and levels off at about 9 months of age, but a cat is not fully an adult until about 1 year. And some cats, especially larger breeds such as Maine Coon Cats and Ragdolls, continue to grow, especially their muscles and bones, until they are 1½ or even 2 years old.

Food preferences are generally established before a kitten is 6 months old. Therefore, it is important to accustom your kitten to eating a nutritionally complete diet at an early age. You should choose two or three products in different forms (dry and canned) that fulfill these requirements and then use them interchangeably.

Vitamin and mineral supplements are not necessary if you are feeding a nutritionally balanced diet. In fact, they may even be harmful. If your kitten is a poor eater and you think these supplements may be needed, discuss this with your veterinarian.

FEEDING GERIATRIC CATS

Preventing obesity is the single most important thing you can do to prolong the life of an older cat. Geriatric cats are less active and may require up to 30 percent fewer calories than do younger cats. If the cat's diet is not adjusted accordingly, overfeeding will result in weight gain.

If you are feeding canned cat food, divide the daily ration into two or three equal parts and feed them at regular intervals throughout the day. Although canned foods need to be stored in the refrigerator once opened, many geriatric cats will eat better if the food is slightly warmed before feeding. Underweight cats may be better off with three or four meals a day.

Counting Calories

Unless maintaining a good body weight is a problem, senior cats should be on a reduced-calorie diet. In general, an older cat who is neither too fat nor too thin needs about 20 calories per pound (.45 kg) of body weight per day—and sometimes even less—to meet her caloric needs. These are guidelines, and the exact amount needed to keep your cat at an ideal weight may vary. Various health conditions may also dictate that your cat needs more or fewer calories.

If the cat's diet is not lower in calories, feeding the adult maintenance food in the same amount the cat has had all her life may result in weight gain. However, you do not need to switch your cat to a senior food if she is doing well on her current adult maintenance diet; you may simply need to feed her a little less. The actual amount to feed your senior cat will depend on the individual cat and her activity level, health, and metabolism. The cat food label will tell you how many calories are in a serving of cat food, and the serving size. Weigh your cat and compute the daily calories required, then determine how much to feed her each day, based on the caloric content of the food. Adjust the amount depending on whether the cat is above or below her ideal weight and whether she is active or sedentary. Cats who lose weight on a calorie-adjusted feeding program may have a medical problem and should be seen by a veterinarian.

Overweight cats should be placed on a weight-loss diet, as described in *Obesity* (page 510). Before doing so, consult your veterinarian to be sure there are no medical reasons for the obesity and that it is safe to cut back the number of calories. Your veterinarian will provide you with diet instructions.

Older cats should lose weight gradually—no more than 1.5 percent of their initial body weight per week. It is important not to feed table scraps and snacks between meals, as the additional calories can unbalance the cat's diet. If you offer treats during the day, you need to adjust the daily meal amounts.

When feeding geriatric cats, it is a good idea to divide the daily ration into several meals spread throughout the day. If your geriatric cat is on a set feeding schedule due to health problems, consult your veterinarian before changing anything.

And remember that older cats are less tolerant of changes in diet, and even of changes in drinking water. When changes are necessary, make them gradually (see *Switching Diets*, page 509).

Protein Requirements

Since you are feeding your older cat less, it is most important that the food be highly digestible to make sure the cat gets all the nutrients she needs. Protein *quality* is of particular importance. Information on how to assess the quality and nutritional value of various cat foods is found beginning on page 496. To ensure that the protein is of the highest quality, look for meat sources of protein in the first ingredients printed on the label.

Although protein is important, a diet too rich in meat produces an increase in nitrogen that must be eliminated by the liver and kidneys. Old cats tend to have reduced kidney function. When given protein in excess of their capacity to excrete it, the blood urea nitrogen level (BUN) rises, and the cat develops *uremia* or kidney failure. This can happen from adding meat products to an already balanced diet in excess of 10 percent of the total daily ration.

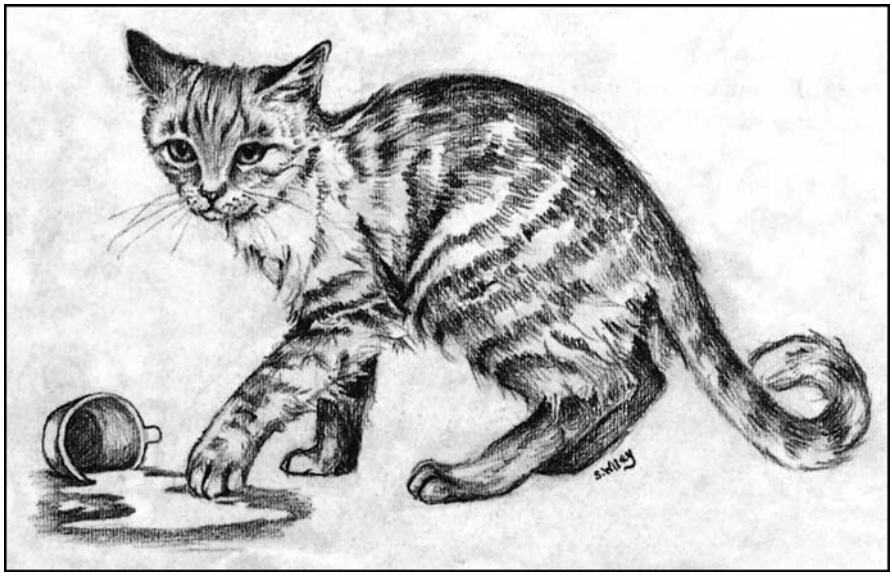
Phosphorus, too, has been shown to accelerate the progress of kidney failure. For cats with kidney failure, a special prescription diet may be recommended.

Since taste and smell diminish with age, the palatability of food becomes increasingly important in encouraging appetite and acceptance. The maintenance food should be supplemented if the cat will not eat enough to maintain body weight. High-quality supplements suitable for the digestive tract of older cats can be supplied by adding small amounts of white meat chicken, white fish meat, boiled egg, cooked and drained ground beef, and, if the cat does not have lactose intolerance problems, low-fat plain yogurt or cottage cheese. If the cat does not maintain weight on this diet, add small amounts of fat to increase palatability and supply extra calories. Plain olive or vegetable oil, or fish oils, are good fat supplements. Always consult your veterinarian before adding any supplements to your cat's diet.

Vitamins and Minerals

Older cats need more vitamins and minerals, because their ability to absorb vitamins through the intestinal tract diminishes as they age. In addition, B vitamins are lost in the urine of cats with reduced kidney function. Calcium and phosphorus in correct balance (1.2:1) help prevent softening of the bones. Most high-quality commercial foods for geriatric cats contain added B vitamins and balanced minerals. If you are feeding one of these products, you should not need to add vitamin and mineral supplements. If the cat has an eating problem, however, discuss supplements with your veterinarian.

A food that's low in magnesium (less than 0.1 percent on a dry-weight basis) is an important consideration for cats suffering from FLUTD. However, low-magnesium diets are not necessarily recommended for all cats.



Despite the iconic image of a cat licking up cream, not all cats can eat dairy products. Diarrhea is a common sign of lactose intolerance.

Antioxidants slow down or prevent the damage done to cells by free radicals. Free radicals are the result of oxidation processes that occur in normal and damaged tissue. A free radical is a molecule that is missing an electron. This molecule basically "steals" an electron from a protein or a piece of DNA, causing damage to that cell. Antioxidants donate a molecule to the free radical, which neutralizes its effects. This also ends the usefulness of the antioxidant, so these substances need to be replaced.

There is some evidence that the accumulation of free radicals accelerates the aging process, and it may even lead to degenerative diseases such as osteoarthritis. Although specific proof is lacking, many veterinarians believe antioxidants can benefit older cats. The antioxidants used most often are vitamin E, vitamin C, and co-enzyme Q. You can safely supplement your cat's diet using an antioxidant product prescribed by your veterinarian.

Special Diets

Prescription diets may be required for cats with heart disease, kidney disease, gastrointestinal disease, or obesity. They are available through your veterinarian.

Switching Diets

It may become necessary to adjust a cat's diet and switch to a new food because of a health problem. This is yet another reason to get your cat accustomed to

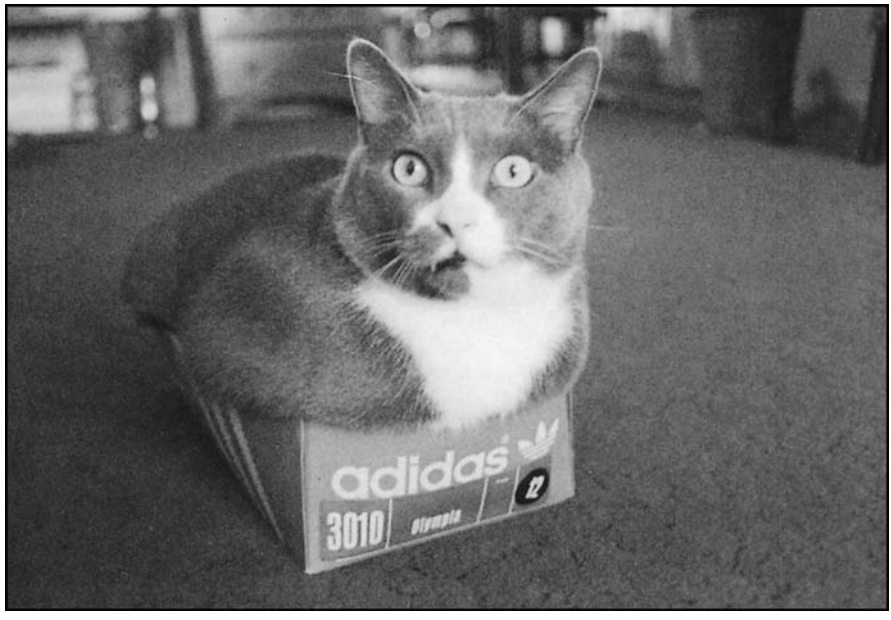
eating several different foods early on. If the cat refuses to eat the new diet, you can switch the food gradually.

Mix together 80 percent of the original food and 20 percent of the new food, and feed the mixture until the cat accepts it. When she does, gradually increase the amount of new food while reducing the original food until the switch is complete. This could take several weeks.

If a cat will not eat a new food, don't assume she will eventually eat rather than starve herself. Some cats will starve themselves rather than eat a food they find unacceptable.

Obesity

Overfeeding leads to obesity. This is a big problem in cats, with estimates of 40 percent of all cats being obese. If you think your cat may be overweight, ask your veterinarian to help you determine the ideal weight in proportion to the cat's height and bones. There should be a layer of subcutaneous fat over the ribs, thick enough to provide some padding and insulation, but not too thick. You should be able to feel the ribs as individual structures but not see them. From above, you should see a well-defined narrowing or waistlike effect below the rib cage and above the hips. If you are unable to feel the individual ribs and the cat has lost her waist, she is carrying too much fat. Many cats, even at a good weight, will have a small "pouch" by the hind legs, but the overall body condition should be fit and trim.



Don't box your cat in by letting her get too fat.

Obesity contributes to arthritis, a fourfold increase in type 2 diabetes, poor haircoat, and hepatic lipidosis—a potentially life-threatening problem.

Food preferences may present problems in redirecting the cat's eating habits. Remember, many cats simply turn carbohydrates directly into fat. They are better off with a diet that is higher in protein and fat and lower in carbohydrates. Review your feeding practices and take the following steps:

- Feed a restricted-calorie reducing diet. Current studies suggest that a high-protein, low-carbohydrate diet may be just as effective or even more so than a low-calorie, high-fiber diet. The high-protein diet is closer to a cat's ideal natural diet, as well.
- Feed regular, measured meals two or three times a day. When your cat has finished what's in her bowl, she must wait for her next meal.
- Do not feed gourmet cat foods, table scraps, or treats. Set aside a few bits of your cat's food from her regular meals for treats during the day.
- Monitor the cat's activity to be sure food is not being found elsewhere.
- Chart the cat's weight weekly. The cat should lose about 1 percent of her body weight per week. Rapid weight loss can lead to hepatic lipidosis.
- Provide daily exercise and human companionship. Many indoor cats need more exercise. Toys, games, and even making the cat work for her food will help—moving food dishes, putting food into interactive toys, and so on.
- L-carnitine as a supplement may be helpful in getting your cat's weight down, as it may increase lean body mass. Discuss with your veterinarian the possibility of feeding 250 to 500 mg per day.
- After four to eight weeks, or when the ideal weight is obtained, feed the cat a high-quality balanced food in the proper amount to maintain her new weight.

Common Feeding Errors

A frequent error is feeding dog food. Never feed dog food to a cat! Cats require twice as much protein and B vitamins as do dogs. Cats, unlike dogs, cannot convert certain dietary precursors into necessary amino acids and water soluble vitamins. A cat given dog food over a long period can develop taurine deficiency, vitamin A deficiency (night blindness), niacin deficiency, retinal degeneration, and other serious or fatal illnesses.

Another common error is to overdose a cat with vitamins A and D or calcium and phosphorus, either by giving the vitamins directly or by supplementing the diet with products that are high in them (such as raw liver or fish oils). Excess vitamin A causes sterility and loss of hair. Excess calcium, phosphorus, and vitamin D cause metabolic bone and kidney disease.

Raw fish should not be fed to cats. Raw fish contains an enzyme that destroys vitamin B1 (thiamin). A deficiency of this vitamin results in brain damage. Fish is also deficient in vitamin E and has the potential to transmit diseases.

SOME GUIDELINES FOR FEEDING CATS

- Never feed dog food. It is deficient in essential nutrients cats require.
- Specialty foods and even table scraps can be given as treats once or twice a week—but only after the regular diet is eaten. Cooked meats (including organ meats such as liver or kidney), cottage cheese, cooked vegetables, cooked fish, milk, and yogurt are foods with strong taste appeal that cats seem to enjoy. Only give them in small amounts and do not offer dairy products if your cat appears to be lactose intolerant (usually evidenced by diarrhea).
- Never feed meats exclusively.
- Treats should never exceed 20 percent of a cat's total daily food.
- Uncooked meat and raw fish should not be given because of the dangers of vitamin deficiency and transmitting diseases.
- Vitamin and mineral supplements are not necessary or desirable if you are feeding a balanced cat food.
- Cats have highly selective eating habits. The location of the food dish, noise, the presence of other animals, and other threats or distractions can adversely affect how much they are willing to eat. A cat in a boarding facility may go an entire week without eating (which can be dangerous).
- Cats prefer to have their food served at room temperature.
- Many cats will not eat if the food dish is located near the litter box.
- Water is a very important nutrient for cats. Always have plenty of fresh water available. Canned food diets are more likely to provide an adequate amount of water than are other types of food.