

## THE DIGESTIVE TRACT

### Point of Departure

The mechanical breakdown of food begins in the mouth, where food is ingested, chewed, and swallowed. Chemical breakdown starts here as well, with the secretion of enzyme-laden saliva.

### Storage and Processing

The stomach acts as a temporary storage and processing facility before emptying its contents into the small intestine. Early stages of digestion take place in the stomach, where pepsin and lipase aid in digesting protein and fat.

### Automatic Transport

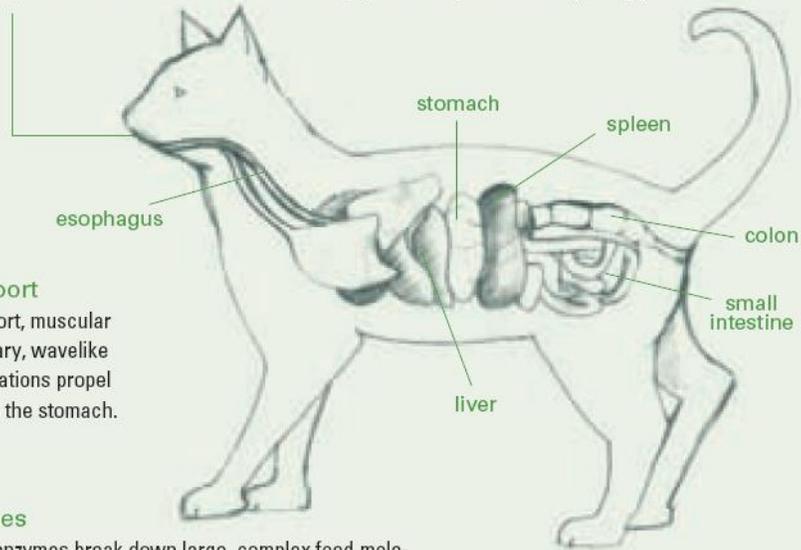
The esophagus is a short, muscular tube in which involuntary, wavelike contractions and relaxations propel food from the mouth to the stomach.

### Treatment Facilities

In the small intestine, enzymes break down large, complex food molecules into simpler units that can be absorbed into the bloodstream. The pancreas is an organ that does double duty secreting digestive enzymes into the gut and hormones, including insulin and glucagon, into the blood. Important for fat metabolism, the liver produces bile and partially stores it in the gall bladder between meals.

### End of the Line

The primary function of the large intestine is to absorb electrolytes and water. Also, this is where microbes ferment nutrients that have so far escaped digestion and absorption.



Cats are obligate (strict) carnivores and are very different from dogs in their nutritional needs. What does it mean to be an 'obligate carnivore'? It means that your cat was built by Mother Nature to get her nutritional needs met by the consumption of a large amount of animal-based proteins (meat/organs) and derives much less nutritional support from plant-based proteins (grains/vegetables). It means that cats lack specific metabolic (enzymatic) pathways and cannot utilize plant proteins as efficiently as animal proteins

## PROTEINS AND AMINO ACIDS

As carnivorous animals, cats derive most of their protein from meat, fish, and other animal products. Some animal-based protein is easier to digest than plant-based protein and is better suited to the cat's digestive system. Dietary protein contains 10 specific amino acids that neither cats nor dogs can make on their own. Known as essential amino acids, they provide the building blocks for many important biologically active compounds and proteins. In addition, they provide the carbon chains needed to make glucose for energy. High-quality proteins have a good balance of all of the essential amino

acids. Deficiencies of single essential amino acids can lead to serious health problems. Arginine, for example, is critical to the removal of ammonia from the body through urine. Without sufficient arginine in the diet, cats may suffer from a toxic buildup of ammonia in the bloodstream. Although not the case for dogs, the amino acid taurine is a dietary essential for cats. Taurine deficiency in cats causes a host of metabolic and clinical problems, including feline central

retinal degeneration and blindness, deafness, cardiomyopathy and heart failure, inadequate immune response, poor neonatal growth, reproductive failure, and congenital defects. Found abundantly in many fish, birds, and small rodents, taurine is either absent or present only in trace amounts in plants. Strict vegetarian diets are not appropriate for cats unless supplemented with nutrients essential for cats that are not found in plants.

### FATS AND FATTY ACIDS

Dietary fats, mainly derived from animal fats and the seed oils of various plants, provide the most concentrated source of energy in the diet. Fats contain more than twice as much energy as protein and carbohydrates per gram. Dietary fats supply essential fatty acids that cannot be synthesized in the body and serve as carriers for important fat-soluble vitamins. Fatty acids play an important role in cell structure and function. Additionally, food fats tend to enhance the taste and texture of a cat's food. The maximum amount of fat in the cat's diet can be reasonably high without any known adverse effects. In many cat foods, 50% or more of the energy comes from fat. Studies indicate that cat foods containing even higher amounts of fat are safe. At a minimum, cat foods should have a fat content of about 9% of dry matter. Essential fatty acids are necessary to keep your cat's skin and coat healthy. Deficiencies in the so-called omega-3 family of essential fatty acids can lead to a host of abnormalities of the nervous system, ranging from vision problems to impaired learning ability. Another family of essential fatty acids, known as omega-6, has been shown to have important physiological effects in the body. Tissues that perform such functions as storage (fat), metabolism (liver), mechanical work (muscle), and excretion (kidney) tend to have cell membranes in which omega-6 fatty acids predominate.

### DAILY RECOMMENDED ALLOWANCES FOR PROTEIN AND FATS:

	Kittens Weighing(800g)	Adult cat( weighing 4kg consuming 250 Kcal)	Nursing cats(weighing 4 kg with 4 kittens)
Crude protein	10 g	12.5 g	41 g
Total fat	4 g	5.5 g	12g

### ENERGY NEEDS

Cats need a certain amount of energy to sustain the normal activities of their daily lives. Growth, pregnancy, lactation, and exercise all increase these normal energy requirements. Generally measured in terms of calories, energy comes from three major dietary components: carbohydrates, protein, and

fats. While not essential in the diet, carbohydrates provide an abundant source of energy. The major sources of carbohydrates in commercial cat foods are cereals, legumes, and other plant foodstuffs. Because cats are carnivores, the short length of their long intestines limits their ability to ferment fibers that are found in many carbohydrates.

## AVERAGE DAILY ENERGY NEEDS

	CALORIES PER DAY (Kilocalories per day*)			
	5 lb	10 lb	15 lb	20 lb
Kittens (after weaning)	200	—	—	—
Lean Domestic Cat	170	280	360	440
Overweight Domestic Cats	180	240	280	310
Exotic (wild) Cats	100–480	170–810	230–1,100	200–1,360
Pregnant/Nursing Cat (4 kittens /4 kittens at peak lactation)	336	603	851	1,091

### ENERGY NEEDS OF KITTENS

Before weaning, kittens need 20–25 Kcalories for every 100 grams of body weight. Cat owners should start supplemental feedings from 2.5 to 4 weeks after birth, because mother’s milk is no longer sufficient.

### ENERGY NEEDS OF PREGNANT AND LACTATING CATS

New mothers typically suckle their kittens for 7 to 9 weeks and will lose weight while nursing no matter what you feed them. That is why it is important to feed your pregnant cat enough to allow her to increase her body weight by 40–50% by the end of her pregnancy. The energy needs of nursing cats generally increase with litter size and through the fourth week of nursing. As a rule of thumb, nursing mothers with more than two kittens need between 2 and 2.5 times the calories they needed at the time of mating. Lactating cats should be given free access to a highly palatable, high-calorie food.

## VITAMINS

Vitamins are organic compounds that take part in a wide range of metabolic activities. Vitamin deficiencies can cause a variety of health problems. Cats cannot synthesize some vitamins from precursors (pre-vitamin structures) in the diet. For example, they must get all of the vitamin A and niacin they need directly from the food they eat. Deficiencies in vitamin A can adversely affect the health of the eyes. Adult cats deprived of niacin in the diet will lose weight and may die as a result. The diets fed to many cats, especially canned food containing fat-laden fish products, make them more susceptible to deficiencies of certain vitamins, such as vitamin E. Vitamin E, an antioxidant, provides protection against oxidative damage. Some vitamins are not only essential in small doses, but are also toxic in excess amounts. Too much vitamin A, a natural consequence of feeding large amounts of liver to growing kittens, can cause hypervitaminosis A, a condition characterized by a variety of skeletal lesions.

## MINERALS

Twelve minerals are known to be essential nutrients for cats. Calcium and phosphorus are crucial to strong bones and teeth. Cats need other minerals, such as magnesium, potassium, and sodium, for nerve impulse transmission, muscle contraction, and cell signaling. Many minerals that are present only in minute amounts in the body, including selenium, copper, and molybdenum, act as helpers in a wide variety of enzymatic reactions. The requirements for certain minerals may change as your cat ages. Cats can get too much or too little of a specific mineral in their diets. An excess of dietary magnesium, for instance, has been implicated in the formation of stones in the urinary tract. Foods that maintain relatively low urinary pH levels, however, have been shown to prevent these stones.

### DAILY RECOMMENDED ALLOWANCES FOR MINERALS

	Functions	Daily Recommended Allowance*	Signs of Deficiency/Excess
<b>Calcium</b>	Formation of bones and teeth; blood coagulation; nerve impulse transmission; muscle contraction; cell signaling	0.18 g	Nutritional secondary hyperparathyroidism; loss of bone mineral content, which can lead to collapse and curvature of lumbar vertebrae and pelvic bones; bone pain, which can progress to pathological fractures Depressed food intake; decreased growth; increased bone mineral density; increased need for magnesium
<b>Phosphorus</b>	Skeletal structure; DNA and RNA structure; energy metabolism; locomotion; acid-base balance	0.16 g	Hemolytic anemia; locomotor disturbances; metabolic acidosis

<b>Magnesium</b>	Enzyme functions; muscle and nerve-cell membrane stability; hormone secretion and function; mineral structure of bones and teeth	25 mg	Poor growth; overextension of the carpal joints; muscle twitching; convulsions <a href="#">Urinary tract stone formation in the presence of high pH</a>
<b>Sodium</b>	Acid-base balance; regulation of osmotic pressure; nerve impulse generation and transmission	42 mg	Anorexia; impaired growth; excessive thirst and drinking; excessive urination
<b>Potassium</b>	Acid-base balance; nerve-impulse transmission; enzymatic reactions; transport functions	0.33 g	Anorexia; retarded growth; neurological disorders, including ataxia and severe muscle weakness
<b>Chlorine</b>	Acid-base balance; osmolarity of extracellular fluids	60 mg	Increased sodium concentration in renal fluid; excess potassium excretion
<b>Iron</b>	Hemoglobin and myoglobin synthesis; energy metabolism	5 mg	Poor growth; pale mucous membranes; lethargy; weakness; diarrhea <a href="#">Vomiting and diarrhea</a>
<b>Copper</b>	Connective tissue formation; iron metabolism; blood cell formation; melanin pigment formation; myelin formation; defense against oxidative damage	0.3 mg	Reduced weight gain; longer time to conceive
<b>Zinc</b>	Enzyme reactions; cell replication; protein and carbohydrate metabolism; skin function; wound healing	4.6 mg	Skin lesions; growth retardation; testicular atrophy
<b>Manganese</b>	Enzyme functions; bone development; neurological function	0.3 mg	No studies of deficiency in cats
<b>Selenium</b>	Defense against oxidative damage; immune response	19 µg	No studies of deficiency in cats
<b>Iodine</b>	Thyroid hormone synthesis; cell differentiation; growth and development of puppies; regulation of metabolic rate	88 µg	Enlargement of thyroid glands <a href="#">Excessive tearing, salivation, and nasal discharge; dandruff</a>

## UNDERWEIGHT OR OVERWEIGHT?

### UNDERWEIGHT



Your cat is not getting enough to eat if it feels “bony” to the touch, has little or no fat on the ribs, and appears to “cave in” just behind the ribs. If chronically underfed, adult cats may experience damage to internal organs, impaired ability to nurse young, and increased susceptibility to bacterial infections and parasites; kittens may be stunted in their growth; adult cats may develop osteoporosis.

### IDEAL



Your cat is at an ideal weight if it appears well-proportioned, shows a moderate waistline behind the ribs, and has a thin covering of fat over the ribs and abdomen.

### OVERWEIGHT



Your cat is overweight if it has heavy fat deposits over the lumbar area, face, and limbs and if there is an obvious rounding or distension of the abdomen. Obesity occurs in one out of four cats in westernized societies and is more common in older and neutered animals. Health risks include diabetes and osteoarthritis.