



## Nutrients in Pet Foods

A pet's nutritional health depends on receiving the correct amounts and proportions of nutrients from the six required groups: water, protein, fat, carbohydrates, minerals and vitamins. With the exception of water, commercial pet foods identified as 100% complete and balanced contain all of these required nutrients. These nutrients are also present in the proper proportions. As important as these nutrients are, it is equally important for pet owners to provide clean, fresh drinking water for their pets so that all of their nutritional needs are met.

### Energy

Although energy is not a nutrient, animals have a requirement for energy and meet that requirement by consuming dietary carbohydrates, protein and fats. Energy is measured in calories and a calorie is defined as the amount of heat required to raise the temperature of one gram of water from 14.5 degrees Celsius to 15.5 degrees Celsius. Because this amount of heat is so small, it is common to describe energy requirements and the energy content of foods in kilocalories (1000 calories = 1 kcal). The term calorie is often used to refer to the amount of energy in 1 kilocalorie.

Energy is a prime regulator of food consumption in most species. Energy in the form of calories provides the driving force in metabolic reactions and allows for the utilization of all other nutrients. It also provides heat to maintain normal body temperature. To estimate the energy values of nutrients for dog rations, the following numbers may be used:

Carbohydrates 3.5 kcals/gram

Protein 3.5 kcals/gram

Fat 8.5 kcals/gram

In dogs these values are considered estimates for predicting the metabolizable energy of a diet.

### Measuring Energy

Animals are not capable of extracting all of the total or gross energy of a food. Because of that, the energy content of a food is measured in several ways.

Gross Energy (G.E.) = total energy content of food measured by bomb calorimetry

Digestible Energy (D.E.) = G.E. - energy in the feces

Metabolizable Energy (M.E.) = D.E. - energy in the urine

The gross energy (G.E.) content of a food is determined by completely burning that food to its ultimate oxidation products: carbon dioxide, water and other gases. The heat given off is considered to be the G.E. of that food.

The digestible energy (D.E.) content of a food is the amount of energy in the food which the animal is able to absorb. It is determined by animal feeding trials in which the G.E. in the food an animal eats is measured along with the G.E. lost in the animal's feces. The difference between these two represents the amount of energy the animal digested and absorbed.

The metabolizable energy (M.E.) content of a food represents the amount of energy in the food which the animal actually utilizes. This is determined by an animal feeding trial in which the G.E. in the food the animal eats, along with the G.E. in the animal's feces and urine, are measured. The difference between G.E. in the food consumed and the G.E. excreted in the feces and urine combined represents the amount of energy available for the animal's use. When the energy content of a pet food is stated on the packaging, it is in terms of M.E.

## **INFLUENCES ON CALORIC REQUIREMENTS**

### **Physiologic State**

Relative to an adult dog, a growing puppy requires as much as two to four times more energy per pound of body weight. As the puppy approaches adulthood, caloric requirements for maintenance are reduced. For reproducing females, caloric requirements at the end of gestation and during early lactation can be two to four times greater than that of adult maintenance requirements.

### **Breed Differences**

Typically, small breed dogs grow to a mature weight, which is up to 30 times greater than their birth weight. The small breed dog category includes those dogs whose mature body weight is less than 20 pounds. The medium breed dog category includes those mature dogs weighing between 20 and 50 pounds, whereas, the large breed dogs include mature dogs weighing 50 to 100 pounds. Giant breed dogs grow to a mature body weight of greater than 100 pounds.

Large, fast-growing dog breeds require less food per pound of body weight than small breeds. To relate energy needs to body size, energy standards for dogs are usually established by body weight. Individual animals can vary greatly from these standards.

Dogs with mature body weights less than 20 lbs. require approximately 50 kcals M.E. per lb. of body weight per day.

Dogs with mature body weights between 20 and 50 lbs. require approximately 30-40 kcals M.E. per lb. of body weight per day.

Dogs with mature body weights greater than 50 lbs. require approximately 20-30 kcals M.E. per lb. of body weight per day.

### **Environment and Activity**

Dogs housed outdoors and exposed to extreme weather (both hot and cold temperatures) have changes in their caloric requirements. During hot weather, energy needs decrease and less food may be required. Conversely, during cold weather energy needs increase to maintain body temperature and more food may be required.

During seasons of conditioning and hard work, individual dogs' energy requirements will be increased above that of maintenance. Caloric standards for working dogs were developed using treadmill dogs running the equivalent of 20 miles per day in a 75 degree Fahrenheit environment with relative humidity of approximately 50%. Hardworking dogs require more energy intake per pound of body weight during the periods when they are training or working. Hardworking dogs include hunting dogs during the hunting season, racing dogs, sheepherding dogs or any animal regularly running long distances. When the animal is not training or working, they do not have elevated caloric requirements and a maintenance-type food may be fed. Feeding high-calorie, nutrient dense foods to dogs when they are not training or working could contribute to excessive weight gain unless appropriate adjustments are made in the amount fed.

Because energy is required for all body processes, animals eat to meet their energy needs. As a result, the intake of all nutrients is influenced by the amount of energy present in the diet. The energy content of the diet generally limits the amount of food an animal will consume. Reputable pet food manufacturers take this into account when formulating complete and balanced pet foods.

### **Water**

All animals depend on water for life processes. Water is found inside and outside cells, and is involved in most biochemical reactions within the body. Water deficits are incompatible with good health. Water is the most important nutrient for survival on a short-term basis, and it is one that is too frequently neglected.

Water is essential in helping regulate body temperature, lubrication of body tissues and as a fluid medium for the blood and lymph systems. Because water is involved in practically every reaction

within an animal's body, any large deviation will be associated with adverse effects. An animal's body, therefore, has several systems designed to maintain constant water balance.

Water intake is controlled by thirst, hunger, metabolic activity (work, gestation, lactation, growth), and the environment (humidity and temperature).

Animals obtain water from the water they drink, fluid ingested with food, and water generated from metabolic processes in the body.

Water is lost in urine, feces, respiration, and to a small extent in flakes of skin, saliva, and nasal secretions. For nursing females, water will also be required for milk production.

An animal's water requirement is determined in large part by the amount of food they consume each day. A general guideline is that animals require 1 ml of water for each kcal of energy. A dog requiring 1000 kcals per day, therefore, would require 1000 ml of water or approximately 1 quart. Some animals would need more than this amount, while others would require less, which is why it is commonly recommended that dogs have a ready source of fresh, clean water available at all times.

### **Sources of Water**

Animals acquire water mainly by drinking water, the water content of food and as a result of metabolism of carbohydrates, proteins and fats. About 15g of water are produced for each 100 kcal of energy metabolized. Thus, a dog consuming 2000 metabolizable kcals of food per day may generate approximately 200 to 250g of water.

### **Food and Water Consumption**

As food intake increases, an animal's water intake also increases. When the water content of a diet increases, the animal usually drinks less water. Therefore, animals consuming canned diets, which contain approximately 70-75% water, will generally drink less water than animals consuming dry diets, which contain about 8-12% water.

### **Protein**

Protein is an essential nutrient and serves numerous functions in the body, including muscle growth, tissue repair, enzymes, blood, immune functions, hormones, and energy. Proteins are defined as groups of amino acids linked to each other in different quantities and sequences. Each protein has a precise combination of amino acids that is specific for that protein, and the arrangement of amino acids determines the specific nature of a protein. Dietary proteins that are digested in the stomach and small intestine are broken down to form free amino acids which are

then absorbed into the bloodstream. Amino acids are distributed to all cells of the body where they are utilized to build body proteins.

Over twenty amino acids are involved in the synthesis of proteins in the body. Ten of these are essential for dogs because they cannot be formed fast enough or in sufficient amounts to meet the requirements for growth and maintenance and, therefore, must be supplied in the diet.

Nonessential amino acids are those that the body can produce in sufficient amounts from other nutrients and metabolites and, thus, do n

*Desc:*

*See how to give your dog the correct amounts and proportions of nutrients from the six required groups so he gets optimal nutritional health.*