

# Nutrition of the Dog

John D. Rhoades, D.V.M.

Department of Veterinary Surgery and Medicine  
College of Veterinary Medicine

A dog needs approximately 43 different nutrients to stay in healthy condition. These nutrients must be present in specific amounts and ratios for optimum nutrient use. The five classes of nutrients are: water, protein, energy, vitamins and minerals.

## Water

Water might be called the forgotten nutrient because it is most often neglected. Clean, fresh water should be available daily to the dog because all the metabolic functions of the animal's body are carried out in the presence of water. The daily water requirement of the dog ranges from 20-40 cc ( $\frac{2}{3}$ -1 $\frac{1}{3}$  oz) per pound of body weight depending on the environmental temperature.

## Protein

Protein quality is as important as the quantity a dog needs. Protein quality refers to an adequate balance of the amino acids in food. Proteins from both meat and vegetables are beneficial to a dog. If a dog is given an excellent quality protein, the protein requirement could be met with a dry diet containing 16 per cent protein or less.

## Energy

Carbohydrates and fats supply energy to the dog. Adult dogs should be fed enough energy to meet body maintenance (see Table 1) and work requirements. Growing puppies should be fed about two times the energy they need for body maintenance.

The pregnant dog does not need extra energy during the first 21 days of pregnancy. During the second 21 days of pregnancy, she should be fed about 15 per cent more energy than she needs for maintenance. During the last 21 days of pregnancy, she should be fed about 50 per cent more energy than her maintenance requirement. The amount of energy needed is much greater for lactation than for maintenance or gestation. During heavy lactation, the dog may need three times her maintenance energy requirement.

Fats contain essential fatty acids. The optimum amount of fat in a dry diet probably falls in the range of 10-20 per cent.

## Vitamins

Vitamins are essential even though they're required in small amounts. Most vitamins are supplied from feedstuffs used in the dog's diet. Remember vitamins A and D as well as the B complex vitamins when you formulate the dog's diet. When B vitamins are deficient, the dog loses appetite and weight.

Vitamin D is particularly important when dogs are raised

in kennels without sunlight for long periods of time. If an animal is being fed an all vegetable diet, vitamin B-12 should be added since it is found only in animal tissue. These are examples of times when a dog may require extra vitamins.

## Minerals

Minerals should be supplied in proper amounts and ratios. Calcium and phosphorus are major minerals. The dog requires approximately one per cent calcium and nine-tenths per cent phosphorus in the diet.

Other major minerals, such as magnesium, sodium, potassium, chloride and sulphur, are needed in larger amounts than the trace minerals. The trace minerals needed are: iron, copper, iodine, manganese and zinc. These are needed at very low levels in the diet. Consider adding iron when puppies receive only a milk diet.

Most dogs depend largely on commercially available diets. These diets are fortified with minerals and vitamins. When commercial diets are fed and the manufacturer's recommendations are followed, problems should be minimal.

Nutritional problems begin when diets are altered and appropriate nutrients are not altered. Commercial diets generally should not be supplemented with additional feedstuffs unless the proper change in minerals and vitamins is made. Nor should diets be supplemented with excess minerals or vitamins.

The average dog now lives better because of improved health care, effective biological practices to control diseases, better education of owners, genetic selectivity and last but not least, better nutrition.

## Over-Nutrition

The dangers of over-nutrition often are overlooked. Over-nutrition has been disregarded primarily because of an eagerness to prevent deficiency diseases. The two major areas of over-nutrition which have affected dogs are obesity and skeletal diseases. Some dogs also receive too many vitamins.

**Obesity** results from an imbalance of energy intake and energy use. The balance of the energy intake compared to use should be zero for the adult dog to maintain weight.

If growing puppies are fed more than two times the energy needed for maintenance, they will become fat. Puppies should be fed enough so they grow steadily without becoming fat.

The energy requirement for maintenance of the dog decreases per pound of body weight as the weight of the dog increases. A small 5-pound dog requires 64 kilocalories of energy per pound of body weight whereas a 110-pound dog requires 38 kilocalories of energy per pound of body weight.

The total amount of energy necessary for the 5-pound dog

**Table 1. Estimated Daily Food Intakes of Air-Dried Dog Food And Energy Requirements of Dogs with Various Weights.**

Weight of Dog (lbs)	Requirements For Maintenance				Requirements For Growth			
	Amount of Food		Energy		Amount of Food		Energy	
	Per lb Body Wt (lbs)	Per Dog (lbs)	Per lb Body Wt (Kcal)	Per Dog (Kcal)	Per lb Body Wt (lbs)	Per Dog (lbs)	Per lb Body Wt (Kcal)	Per Dog (Kcal)
5	.040	.2	64	320	.080	.4	128	640
10	.033	.3	52	520	.066	.7	104	1040
15	.028	.4	45	675	.056	.8	90	1350
20	.027	.5	43	860	.054	1.0	86	1720
30	.025	.8	40	1200	.050	1.6	80	2400
50	.025	1.3	40	2000	.050	2.6	80	4000
70	.025	1.8	40	2800	.050	3.6	80	5600
110	.024	2.6	38	4180	.048	5.3	76	8360

This Table was Adapted From Nutrient Requirements Of Dogs, National Academy Of Sciences

is 320 kilocalories of energy per day, and this may be supplied by .2 of a pound of dry dog food. The larger, 110-pound dog requires 4,180 kilocalories of energy per day, and this may be supplied by 2.6 pounds of dry dog food per day. Air-dried dog foods contain 8-12 per cent moisture and 1,590 kilocalories of energy per pound on the average.

Table 1 illustrates estimated daily food intakes and energy requirements for maintenance and growth of dogs with various weights.

If these guidelines are not followed and the dog is allowed to eat all it wants, obesity may occur. An obese dog with congestive heart disease must be placed on a reduced calorie diet as well as a diet low in sodium content.

Obese dogs are less resistant to viruses; this may mean they are more susceptible to certain viral infections and do not respond to therapy as well as dogs which are not obese.

**Skeletal diseases** have been recognized for a long time. The causes of many skeletal diseases have been deficiencies of various nutrients, especially calcium, in the diet. Calcium deficiency is normally associated with rickets (defective bone growth) in young growing animals and with either osteomalacia (softening of the bones) or osteoporosis (decreasing bone mass and enlarging of bone spaces) in adults.

Over-feeding of phosphorus or an imbalance of calcium and phosphorus also may make dogs susceptible to skeletal diseases. Prevention of skeletal diseases must begin early in the life of the dog, preferably during gestation.

Hypertrophic osteodystrophy (excessive bone formation) is a metabolic disease associated with excessive calcium intake. The disease is manifested by accelerated, poor quality bone formation and occurs when the animal is fed excessive amounts of minerals during the growth period.

Nutritional secondary hyperparathyroidism (presence of excess parathyroid hormone) is a metabolic disease associated with excessive phosphorus intake which causes young dogs to be lame; the lameness varies in degree from slight limping to obvious fractures of the long bones. Other signs of excess phosphorus are tetany (mineral imbalance which causes muscle spasms), reproductive failure and altered requirements for other nutrients.

Adequate and proper calcium and phosphorus nutrition depends on three major factors:

- **A sufficient supply of calcium and phosphorus.** Consider availability of calcium and phosphorus when determining amounts of calcium and phosphorus needed in a diet. Calcium absorption has been shown to be decreased when

diets are low in vitamin D and high in a certain form of unavailable phosphorus found in some plants. Thus, the calcium and phosphorus requirements of the dog are closely related.

- **A suitable ratio of calcium and phosphorus.** The adult dog should receive a calcium to phosphorus ratio of 1.2-1.5 to 1. During lactation, the calcium to phosphorus ratio should be about (but not exceed) 1.5 to 1. Adult dogs need about 55 milligrams of calcium per pound of body weight per day and about 45 milligrams of phosphorus per pound of body weight per day. Note this calcium to phosphorus ratio is 1.2 to 1.

The growing puppy needs more calcium and phosphorus for growth than does the adult dog. The growing puppy needs 120 milligrams of calcium per pound of body weight per day and 95 milligrams of phosphorus per pound of body weight per day. This ratio is about 1.3 to 1 calcium to phosphorus.

This amount of calcium and phosphorus generally is supplied by the diet. If the diet is properly balanced, supplements are not necessary. Recall the growing puppy is eating about two times more food than the adult per pound of body weight, thus it is consuming two times more calcium and phosphorus.

- **The presence of vitamin D.** This is a fat soluble vitamin necessary for proper calcium and phosphorus nutrition. Diets low in calcium and supplemented with vitamin D have resulted in lameness, abnormal stances and loss of bone density.

Table 2 lists nutrient requirements for adult and growing dogs. Excess vitamin D results in calcification of soft tissues, anorexia (loss of appetite), fatigue, renal (kidney) damage, hypercalcemia (excess calcium in the blood), diarrhea, dehydration and even death.

You can prevent over-nutrition or over-supplementation in dogs' diets. First, do not give excessive amounts of either vitamins or minerals. Secondly, feed a well-balanced diet to meet nutritional requirements. If growing, pregnant or lactating dogs are fed the proper amounts of well-balanced diets, food supplements won't be necessary.

**Table 2. Nutrient Requirements of Dogs—Amounts Per Pound Of Body Weight Per Day**

Nutrient	Adult Maintenance	Growing Puppies
Protein, grams	2	4
Calcium, milligrams	55	120
Phosphorus, milligrams	45	95
Vitamin D, IU	45	90

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