



The Effect of Breed Size on Nutritional Considerations for Growing Puppies Purina Research Project – Spring 2001

Dogs are a unique species in that the adult body size of different breeds can range by nearly 100-fold. These differences in body size and associated metabolic differences have a pronounced effect on appropriate dietary formulation for these animals. In addition to different energy needs, the requirements for certain key nutrients appear to differ between large and small breeds. This is especially true for growing puppies.

Effect of breed size on energy requirements: Small breed adult dogs can have maintenance energy needs per unit body weight that approximate two to three-fold the needs of large or giant breed dogs. Multiply this by the incremental requirements for growth, and it is clear that puppies of small breeds have extreme energy requirements. Large and giant breed dogs, on the other hand, generally need fewer calories per unit body weight. Excess calorie intake in growing puppies can lead to obesity. In addition, overconsumption of calories in large and giant breed puppies can promote too rapid growth. Rapid growth in several species, including dogs, rats and humans, appears to increase the incidence of skeletal abnormalities (4). Restricting food intake slows the rate of growth, which can be beneficial in puppies susceptible to these problems (3). Thus, meeting the puppy's energy needs for normal growth is essential, but excessive intake should be avoided.

Effect of breed size on protein requirements: Most studies suggest that if approximately 17% to 22% of calories consumed are provided as good quality protein, the diet should meet the minimal protein requirement for growing puppies of all breeds. (7) However, results from recent studies evaluating Great Dane and Miniature Poodle puppies suggest that more protein may be needed if factors other than growth are considered. These pups were fed an identical diet with 21% dietary protein (energy basis). (5) While growth was normal for both groups, reduced packed cell volume, serum albumin and urea nitrogen in the Great Dane puppies suggested that the diet was sub-optimal in protein content for these large breed puppies. In addition, other investigators evaluating the requirement for the essential amino acid, methionine, identified that Labrador puppies require approximately 50% more of this amino acid on an energy basis, compared to Beagle puppies. (1) Purina research also suggests that a protein level of approximately 25% of the energy is more appropriate for large breed puppies.

Excessive intake of dietary protein has been suggested as a contributing factor to skeletal developmental problems, such as osteochondrosis, in large breed dogs. This hypothesis was tested by feeding Great Dane puppies either 15%, 23% or 32% dietary protein (13%, 21% or 29% of energy). (6) While the low protein diet reduced growth, no detrimental effects from the higher protein diets were observed.

Effect of breed size on calcium requirements: A deficiency of calcium in growing puppies can

lead to osteoporosis or osteodystrophy and spontaneous fractures. Excess calcium also can contribute to skeletal malformations, as well as depressed growth and secondary deficiencies of nutrients such as zinc. Breed differences in calcium metabolism were illustrated by observations on Miniature Poodle and Great Dane puppies fed similar diets with varying calcium content. (5) The smaller puppies were able to tolerate calcium as low as 0.33% and as high as 3.3% with only very minimal changes. The Great Danes, however, developed significant pathological lesions when fed either 3.3% calcium (osteochondrosis and stunted growth), or 0.59% calcium (osteoporosis and pathologic fractures). The latter occurred despite using a highly available source of calcium. (2) Thus, large breed puppies are more susceptible to both excesses and deficiencies of calcium, compared to small breed dogs. A dietary calcium level averaging between 1.0% and 1.5% of the diet, depending on energy concentration, is safe and appropriate for puppies of all sizes, while extremes should be avoided.

Effect of caloric content of the diet: For puppies, as for dogs or cats of any age, it is important to recommend or feed diets with an energy density appropriate to the individual. Most nutritionally complete and balanced diets are formulated such that as an animal meets its energy needs, its needs for other nutrients are also satisfied. If a diet that is too high in caloric density is fed, it will be necessary to restrict the amount fed to avoid obesity or excessive growth rate. This results in less food being consumed, thus a restriction in other essential nutrients. On the other hand, feeding a diet that is too low in caloric density for the individual can result in inadequate caloric consumption due to restrictive stomach capacity or to greater intake of dry matter resulting in unnecessarily large stool volume.

Many veterinarians recommend feeding an adult dog food to growing large breed puppies on the assumption that adult foods are lower in calories. However, before recommending or feeding any particular food, it is important to know the specific calorie density of that product. Several puppy foods that have been marketed for years have caloric contents less than those of some of the newer foods recommended for large breed puppies, just as many adult foods have a higher calorie content than some puppy foods. Information on the calorie content of pet foods can be obtained from label or product information or by calling the manufacturer. Alternately, the relative calorie content can be estimated from the percent fat in the product with higher fat products generally containing more calories.

References:

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