

Optimal Nutrition for the Exercising Dog: Providing Nutrients That Make a Difference

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Health and well-being are optimized with proper nutrition. In his research on what constitutes proper nutrition, Dr. Brian Zanghi said he considered several groups of dogs, including sporting breeds that are very active in their daily life. He found that optimal nutrition results in dogs that are stronger, leaner, healthier, faster, and more alert.

Optimal nutrition is achieved through consuming foods that contain a proper balance of nutrients, he said. Nutrients are used as building blocks for the body, as signaling molecules, and for energy.

During exercise, a dog needs more energy and endurance, and therefore incurs greater caloric demand, increases protein metabolism, shifts nutrient utilization for energy in the muscle from glucose to fat, and requires more ability to metabolize oxygen. An unfortunate consequence of increased oxygen metabolism, Dr. Zanghi said, is the generation of increased oxygen radicals.

Most research conducted on the role of nutrients in optimizing exercise physiology has studied breeds on the far ends of the endurance spectrum — Alaskan sled dogs, which travel long distances, and Greyhounds, which run short sprints.

One study that focused on sled dogs compared the effects of high-fat and high-carbohydrate diets on exercising animals. Dietary fat is critical to promote fat metabolism and maintain high levels of fatty acids in the blood. Dogs that ate a high-carbohydrate diet had low levels of fatty acids in their blood both before and after exercise. Following exercise, those dogs had less ability to mobilize nutrients and promote aerobic metabolism, or higher endurance activity. When switched to a high-fat diet, subjects had higher levels of these substrates in their blood, and mobilization improved.

Nutrients can also shift the cellular makeup, as illustrated in a study of Alaskan sled dogs and Labrador Retrievers. The proportion of mitochondrial content in the muscle of Labradors on the high-carbohydrate diet was measured, Dr. Zanghi said. The Labradors were then switched to the high-fat diet. Shifting the diet increased the Labradors' metabolic capacity to slightly greater than the metabolic capacity of the sled dogs. This data suggests that endurance is not controlled solely by genetics.

The study also looked at maximum oxygen utilization with exercise: the higher the level of oxygen utilization, the greater the metabolic capacity and endurance. Once the Labradors were switched from the high-carbohydrate diet to the high-fat diet, Dr. Zanghi said, their metabolic and endurance capacity rose to that of the sled dogs.

High levels of dietary protein and fat promote increased mitochondrial synthesis for increased oxygen metabolism. Feeding a high-quality diet—high protein, high fat—will metabolically prime dogs to use these fuels during exercise. Switching from a performance food in the off-season may reduce the dog's capacity to utilize fat, he said, and reduce the animal's endurance.

Free radicals are a natural consequence of fat metabolism and using oxygen to generate energy. As endurance and aerobic metabolism increase, so do oxygen free radicals. Dr. Zanghi said proper nutrition could mitigate the negative effects of free radicals by providing antioxidant support, optimizing recovery after exercise.

Sources of oxidative stress during exercise are not only in the mitochondria but also occur in immune cells, where slight, low-grade inflammation can occur after bouts of strenuous exercise. Reducing inflammation or recovery time becomes very important, he said.

A recent study by Nestlé Purina evaluated antioxidants in the diet to see what kind of benefit they would provide to the exercising animal to reduce oxidative stress. Dogs in the placebo group received a regular performance diet with no antioxidant supplement. Dr. Zanghi said that within 24 hours of exercise, a considerable increase in the level of the oxidative stress biomarker—*isoprostane*—was noted. Conversely, dogs receiving the antioxidant *astaxanthin* showed a lower level of *isoprostane*, indicating optimal recovery.

Nutrients are also critical for skeletal health. *Glucosamine* promotes natural lubrication in joints. *Omega-3* fatty acids improve joint mobility, Dr. Zanghi said, particularly in dogs with *osteoarthritis*. Protein is needed to build and resynthesize muscles. Because an exercising dog has an increased level of protein metabolism, a higher level of protein in the diet helps keep the dog in a state of positive protein balance. Stress associated with physical activity could potentially be more detrimental in a dog fed a low-protein diet.

Optimal sensory perception is dependent on proper nutrition, Dr. Zanghi said. Studies showed that the *omega-3* fatty acid *docosahexaenoic acid (DHA)*, a nutrient found in mother's milk, helped in brain and vision development. Visual ability also has been enhanced in studies on dietary fat. Puppies fed a diet rich in *DHA* had greater sensitivity to light and darkness, and therefore could see better in low light.

Proper levels of dietary nutrients are very important to cognitive function. Blood glucose coming from glycogen stores in the liver is used primarily to support brain function, especially for staying focused and alert. With high-carbohydrate diets, Dr. Zanghi said, the body recognizes carbohydrates as its main source of energy. It stores them as glycogen in the muscles, but at higher levels than normal. When the muscle glycogen is depleted, liver glycogen is tapped, which leaves less blood glucose for the brain to use. The result is an earlier incidence of fatigue. With high-fat diets, the body depends less on storing glycogen to support muscle function, and therefore utilizes less.

Nutrients also have been shown to support optimal weight. In a longevity study of dogs, Dr. Zanghi said a diet containing the optimal ratio of protein to fat helped maintain lean muscle mass and healthy body condition. Even when fed higher quantities of food, the balanced nutrition in the diet helped promote a good body condition score.

Discussion

A participant reiterated the importance of proper weight management in dogs. Fat is not healthy, she said, and it is “up to us” to educate people.

Another participant expressed concern about the amount of nutrients her dog would receive if she fed it a less high-performance food. Dr. Zanghi replied that decreasing the quantity of food does not change the ratio of protein to fat in the diet. Animals need fewer calories in the off-season, he said; the key is to maintain lean muscle mass.

A participant cited an example of puppies fed a diet of 36% protein for 3–5 months. She described the puppies as thin, with broken-down and flattening feet. She asked whether this condition could be the result of the high protein diet. Protein has never contributed to improper growth, Dr. Zanghi said. Dogs should be able to tolerate up to 40%–50% protein in their diet with no deleterious effects. He said he considered it unlikely the puppies’ condition would be due to elevated protein.