# The new age of working dogs

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Nutrition research in working dogs has focused primarily on sprinting Greyhounds and endurance sled dogs. More recent investigation into other sporting arenas like agility (and like events), olfactory task oriented dogs (detection dogs and foxhounds) suggest other areas need to be addressed for optimal performance. Unfortunately in the past 10 years as performance endeavors have changed and evolved, little research has been performed examining nutrition and its role in these athletic endeavors creating a need to dispel myth and mold research findings into every day practices remains a challenge.

**Energy for Exercise:**

Increasing physical activity and the effects of training have been extensively studied in dogs during treadmill exercise. For all practical intents and purposes an average 20 kg Foxhound or Alaskan sled dog working at maximal oxygen consumption burns approximately 700-900 kilocalories per hour. In the field there are other factors to take into consideration such as external temperature, thermal regulation, variability in terrain and incline versus decline. Dietary calculations and metabolic studies have suggested that Alaskan huskies training in the northeast United States showed an ME of approximately 4000-5000 kcals while rigorous racing conditions may require over 10,000 kcals (1-4). Working Greyhounds have shown that the average 32-35 kg Greyhound expends approximately 2050 to 2160 kcals per day. These studies take into account the typical training regimen for a racing Greyhound, which includes being penned or caged with daily sprint training in enclosed paddocks for approximately 30 minutes and two races a week (5,6). Interestingly studies by Hill and colleagues suggested that feed restriction during of 15% during racing results in better racing times (6). Though speculative, agility, dock, earth, fly ball, sprint-sled racing, short distance skijoring, lure coursing, and field trial dogs may benefit from similar feeding practices before and during competition.

**Dietary Protein – beyond energy**

Dietary protein helps maintain musculoskeletal integrity and appropriate total protein, albumin and red blood cell status. The hematocrit and serum albumin tend to decrease with training and racing which appears to be a result of the overtraining syndrome in endurance dogs (1,7). Adequate protein intake may be helpful in ameliorating this condition. Studies examining protein consumption and its role in maintaining red blood cell counts and hematocrit in training sled dogs have postulated that approximately 24-30% of the metabolizable energy (60-80g protein/1000 kcals) should come from highly digestible animal based protein (8,9).

In sprinting dogs, the picture is similar whereby around 24% of the ME should come from high quality protein sources with some studies suggesting that more may be deleterious to performance in sprinting dogs.

**Dietary Fat and Carbohydrate – Energy and demands**

Unlike athletic humans, athletic dogs appear to function well and remain healthy on higher fat diets. The generation of energy from fat is up to 70% of the ME during long-duration exercise, suggesting a propensity for fat utilization due to the dog's high aerobic activity in skeletal muscle and increased mitochondrial density as compared to humans (10). This concept of high fat diets has infiltrated over to shorter duration activities such as agility whereby competitors are often on higher protein and fat diets as if these dogs were endurance hunting dogs or huskies. Previous reports suggesting higher carbohydrate diets enhance performance which are approximately 30% ME fat (around 12-15% dry matter fat) and 24% ME protein (22-26% dry matter protein) with the remaining ME from carbohydrate may be more appropriate for the sprinting athletes such as agility, dock diving, fly ball, earth and lure coursing dogs (9). Fortunately, for dog owners this type of dietary breakdown results in a product that would be approximately 24-28% dry matter protein, 12-14 % dry matter fat and 45-50% carbohydrate, which is similar to many commercial adult pet foods on the market.

**Carbohydrates–timing and strategy**

The use of carbohydrate as a major dietary substrate makes sense in sprinting animals like Greyhounds. Considerable attention has been given to the source of carbohydrate used in commercial diets suggesting that more complex dietary carbohydrate sources such as barley and sorghum may provide a more gradual release of glucose to the blood stream improving the glycemic index (11). It is still unclear as to how this would benefit the performance canine, particularly since feeding regimens are unlikely to take advantage of available glucose. Studies performed in sprint sled dogs have definitively shown that post exercise supplementation with a maltodextrin supplement at 1.5gm/kg BW within 30 minutes of exercise increases skeletal muscle glycogen within 4 to 24 hours (12,13). Based on this information post exercise carbohydrate repletion is recommended in dogs running anywhere between five minutes and three hours per day at high intensity, particularly when expected to perform similarly the following day.

**Dietary Fat – Beyond Fuel:**

Many performance animals including foxhounds, hunting dogs and service detection dogs rely on detection capabilities, therefore the potential for increased polyunsaturated fatty acids in olfaction should be discussed. A small study showed that olfactory performance appeared to be enhanced or maintained when dogs were provided a base diet in which dietary fat sources were switched from animal based fat to corn oil based fat, however the results of this study truly showed that conditioning was more important for detection capabilities (14). As a follow up to this study, a larger study was performed whereby 17 conditioned Labrador detection were provided three different diets containing 26% ME protein, 28% ME fat (typical adult maintenance diet), 26% ME protein and 57% ME fat (typical performance diet), or 18% ME protein and 57% ME fat (typical adult diet + supplemental corn oil) for 12 weeks and then underwent a treadmill exercise. After examining all of the possible things that could enhance olfaction the 18% ME protein and 57% ME corn oil enriched diet appeared superior (15). Exactly what led to the increased olfactory acuity remains to be determined, however current postulation is that increased polyunsaturated fats in the olfactory epithelium may lead to better sensory signaling, and/or a decrease in core body temperature. Regardless, these findings warrant further investigation into moderate protein, high fat diets for performance dogs dependent on olfactory stimuli (hunting dogs, foxhounds, detection dogs) for success.

**Dietary Supplementation:**

There has been significant discussion surrounding the idea of antioxidant of vitamin and mineral supplementation in exercise. Much of this was initiated by pilot studies reporting that serum antioxidants such as vitamin E and vitamin C were depeleted in serum post exercise and that oxidative damage due to exercise may be the culprit (7,16). However after many years of examining various supplements in endurance huskies and Greyhounds including vitamins C and E, there has been no consensus regarding their efficacy of preventing oxidative damage or protecting skeletal muscle from increased permeability changes reflected as creatine kinase activity or decreasing exertional rhabdomyolysis (17-19). In fact, in racing Greyhounds the supplementing of vitamin E and C have been associated with increased racing times (20,21). The lack of efficacy in antioxidant or pro-energetic supplementation to enhance performance or decrease biochemical manifestations of muscle damage has led to ambiguity regarding their efficacy as antioxidants for sporting dogs (22-24). Newer insights into maintaining muscle integrity and improving energetics have been attempted through supplements such as β-hydroxy-β-methylbutyrate, resveratrol and betaine (25-29), with a proprietary supplement showing promising results in a group of coyote hunting dogs (30).

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