

Energy and the Working Dog

By Angie Untisz DVM

Working dogs are truly premier canine athletes. As such, one should pay close attention to meeting their energy needs. There are 3 sources of energy... fats, carbohydrates and proteins. Understanding how the working dog utilizes energy and how best to balance these energy stores can result in a more responsive partner that is less prone to physical injury.

Fats are the most energy dense of all the sources providing 70-90% of the energy needed for muscle contraction (primarily fueling slow twitch fibers). In the working dog, 50-65% of total energy in a diet should come from fats. (This translates to 25-32.5% fat on a dry matter basis.) When fed a high fat diet, the working dog will develop pathways that promote aerobic oxidation of free fatty acids (fat adaptation). In addition, adding an anti-oxidant such as Vitamin E and the amino acid l-carnitine can improve the muscle's use of fat. Aerobic oxidation of free fatty acids leads to less lactic acid build up in the muscle and better endurance.

Carbohydrates are stored in muscle as glycogen. Muscle uses glycogen during the initial moments of activity and for bursts of speed and power (primarily fueling fast twitch fibers). Glycogen stores are relatively small and can be rapidly depleted leading to muscle weakness and fatigue. However, diets high in carbohydrates can lead to deconditioning (poor endurance, obesity, muscle injury). For a working dog, carbohydrates should be limited to 10-15% of the total energy in the diet. To improve the working dog's use of carbohydrates, one should focus on replenishing glycogen stores and slowing glycogen depletion.

Replenishing glycogen stores is accomplished by providing a "good carbohydrate" at an appropriate time. Muscle cells have GLUT4 pathways that are active during exercise and for up to 30 minutes after exercise. These pathways allow for the uptake of carbohydrate into the muscle without the release of insulin. Simple sugars (glucose, dextrose, fructose, corn syrup) cause an insulin release that leads to subsequent hypoglycemia (low blood sugar). Complex starches (bread, rice, grains) take too long to be digested and absorbed. Both cause fluid imbalances that can contribute to diarrhea and dehydration. Maltodextrin is a small complex carbohydrate and is the ideal carbohydrate for this purpose. Maltodextrin is rapidly absorbed without an insulin release or fluid imbalance and is readily utilized by the GLUT4 pathway. When a maltodextrin supplement is given within 30 minutes of exercise, up to 85% of pre-exercise glycogen levels are restored. Without this targeted approach, only 40% of pre-exercise levels are restored.

Slowing depletion of glycogen stores is accomplished in two ways. First, when enough fat is fed, slow twitch fibers will use free fatty acids as their energy source (fat adaptation) sparing glycogen for use by fast twitch fibers. Second, supplementing prior to activity with a "good carbohydrate" such as maltodextrin will give the working dog a little carbohydrate "to burn" before starting on the glycogen stores. It is very important to avoid simple sugars and starches to avoid insulin spikes and fluid imbalances.

Proteins are the building blocks of muscle and should not be a major source of energy. Animal source proteins (chicken, beef, lamb, egg, etc.) are preferred and often offer increased digestibility with a good amino acid balance. Diets low in protein have been associated with increased injuries. A working dog diet should have a minimum 26% protein. For hard working dogs, diets containing 30-40% protein are even better. The goal is to spare the use of protein as an energy source so it can be used to build muscle mass and repair muscle damage.

In summary, working dogs should be fed a diet high in fat to optimize energy availability and high in protein to protect against injury. Carbohydrates should be supplemented at appropriate times to improve their storage. Remember, feed for energy and you will have energetic dogs.

Author's note: I am frequently asked what and how I feed my dogs. I feed a quality performance kibble that is 32% protein and 21% fat. I add a balanced fat supplement so that total calories from fat range from 50-55%. Approximately 13-18% calories are from carbohydrates. I adjust the total amount fed based on the dog's activity and body condition. (Beware, feeding a high energy diet can lead to obesity if one is not monitoring the dog's body condition on a regular basis.) I give a maltodextrin supplement after working. I give 500mg Vitamin E, 500mg l-carnitine and 400mg glucosamine daily.