The Amazing Race

How do sled dogs endure Alaska’s grueling Iditarod?

Early next month, about 1,000 dogs will compete in the Iditarod, the world’s longest sled dog race. More than 70 teams will cover 1,850 kilometers (1,150 miles) of rough, often icy, terrain from Anchorage to Nome, Alaska. Along the way, the teams are likely to encounter whiteout conditions with gale-force winds and temperatures as low as -40 degrees.

Just finishing such a race, let alone winning it, requires super-canine levels of endurance. How do the dogs do it? For 10 years, Michael Davis, a professor of veterinary physiology at Oklahoma State University, has been conducting studies to find out.

“The dogs have a hidden strategy,” he says. “They are fatigue-proof.”

COOL CANINES

Davis has tested about 5,000 sled dogs over the years. Many are pure-bred Siberian huskies. The rest are mutts—mixtures of Siberian husky, Alaskan malamute, pointer, and other breeds.

What gives the dogs their incredible stamina? One answer is the Alaska winter. All dogs are prone to overheating because they don’t perspire, as people do. When you perspire, body heat escapes into the air as the sweat on your skin evaporates. In a dog, body heat is expelled instead with the moisture released by the animal’s respiratory (breathing) tract. That process is very inefficient, says Davis, and becomes even more so as the temperature of the air increases. So dogs can exercise strenuously only in the very cold.

“In most cases, the musher [sled driver] has to control the speed of the dogs to limit the rate at which they produce heat until the temperature drops below 10 degrees Fahrenheit [-12 degrees Celsius] or so,” says Davis. “Below that temperature, the dogs can generally run as fast as they want without worrying about overheating.”

Along the route, the mushers monitor the dogs for signs of overheating—stumbling and weaving. Overheating can damage a dog’s brain, kidneys, and muscles and even kill the animal. “If a dog starts to overheat on the trail, the musher will remove it from the team, pack snow around it to cool it, and put it

Sled dogs eat and rest at checkpoints along the 1,850-kilometer Iditarod route.
inside the sled until they get to the next checkpoint,” he says.

To help the dogs maintain their endurance, the mushers maintain a 50-50 schedule. “Unless trail or race conditions dictate otherwise, most mushers will run six hours, then rest six hours,” says Davis. “The dogs are fed large meals at the beginning and end of each rest period. They are also given frequent quick snacks on the trail, with the musher stopping for just a few minutes to distribute the small treats.”

Iditarod dogs are fed a diet that is 60 percent to 70 percent fat and includes salmon and lard balls. The combination of meals and snacks amounts to about 12,000 kilocalories a day—the equivalent of 24 Big Macs. High-fat diets can clog the arteries, but not those of the Iditarod dogs. “We never see dogs with heart problems,” says Davis. “It may be as simple as the fact that they burn the fat so quickly, it’s not around long enough to cause a problem. It is probably more complicated than that, though. During the summer, when they’re not racing, the dogs still eat a high-fat diet without any problems.”

Davis believes that the muscle cells in sled dogs have a unique ability to transport more nutrients across their membranes. The membrane is the barrier that separates the cell from its surroundings. That ability enables the muscle cells to absorb nutrients directly from the bloodstream instead of from storage in the muscles. Fatigue occurs in dogs and humans when stored nutrients are used up too quickly.

**DAMAGE CONTROL**

Iditarod dogs have other amazing abilities. Months of training may double their *aerobic capacity*—the ability to process oxygen. That enhanced capacity has two components, says Davis. The first is a well-conditioned heart and circulatory system, which transports oxygen more efficiently to the muscles. The second is a high density of *mitochondria* in the muscle cells. Mitochondria are structures that use oxygen to break down digested food and release energy. (See “Power Cells.”)

Finally, Davis has discovered that Iditarod dogs can “reprogram” their bodies. In humans, strenuous exercise causes the muscle cells to leak enzymes and proteins. The cells need a day or two of rest to recover.

In the Iditarod dogs, continued exercise does no further muscle damage. “It’s as though they are starting off fresh at the beginning of each day,” says Davis. “When people run a marathon, they have to take the next day, or four or five days, off to recover. But by reprogramming their bodies, sled dogs can run marathons day after day after day.”

**BEING THERE**

Each year, Davis and his colleagues spend the winter in Alaska testing dogs. Their time there isn’t all work and no play, though. They get to watch Alaska’s most popular sporting event. “You have to be prepared for things to be very cold, since you can’t control the weather and the race must go on,” he says. “The dogs are excited,” he adds, “the mushers are excited, and so are we.”

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**Power Cells**

Dogs (and people) respire in two ways. *Respiration* is the act of taking in oxygen (and releasing carbon dioxide) through the nose, mouth, windpipe, and lungs. *Cellular respiration* is the chemical process in which digested food in the form of glucose is broken down to release energy. Mitochondria, the cells’ power stations, break down the glucose aerobically (with oxygen) and release energy (and carbon dioxide). Sled dogs are more energetic than other dogs because their muscle cells contain more mitochondria.