

## HOW THE ONE-HUMPED DROMEDARY (CAMEL) OF THE ARABIAN AND AFRICAN DESERTS THRIVES IN SOME OF THE HOTTEST AND DRIEST CLIMATES ON EARTH

During the past 3 million years, various physiological and behavioral mechanisms have evolved in the dromedary or one-humped camel (*Camelus dromedarius*) that enable it to survive on the Arabian and African deserts, where temperatures in the summer can exceed 140° F (60° C). What particularly distinguishes the desert camel is its ability to relinquish strict homeothermy and allow its body temperature to fluctuate with that of the environment. As a result, the difference between a camel's body temperature and that of the environment is never large; thus, the flow of heat from the air to the body is reduced.

Another of the camel's physiological adaptations to heat is its "adjustable" metabolic rate. As the desert temperature increases, the camel's metabolic rate slows. Due to slow dehydration, the amount of thyroxine that the thyroid gland produces drops. With less thyroxine, the camel's respiratory rate also slows, thereby reducing water loss via breathing.

Camel blood is unusual in two ways: its plasma contains more water than that of other animals, and its oval-shaped red blood cells (see figure 26.4c) stay intact even when the plasma surrounding the cells has a high osmolarity (they do not crenate). Under similar conditions, the red blood cells of other mammals would crenate, and the

blood would cease flowing and transporting body heat outward to the skin, leading to a heatstroke. But even after a camel has lost more than half of its body water, its blood continues to circulate and dissipate heat.

The camel also conserves water by excreting extremely dry feces and recycling water from the kidneys to the stomach and back to the blood. (By contrast, other ruminants [cows and goats] cannot recycle water and lose so much fluid when heat stressed that the alimentary tract and kidneys cease functioning entirely.) A camel, after recycling water for weeks, can drink 40 gallons of water and rehydrate its blood in less than an hour.

To counteract heat and dehydration, the camel also modifies its behavior. When possible, it lies down, thereby reducing the heat energy that muscle activity and metabolism produce. Camels also take advantage of the shade cast by other camels and squat close to each other, creating an even larger cooled area. At the same time, each camel faces the sun so that the hump absorbs most of the direct sunlight, and the smallest possible body area is exposed. The hump is a concentration of body fat that acts as a sunscreen, to shield the camel's vital organs. The camel also urinates on its long legs, and evaporation of the urine cools the blood vessels in the legs.