



Thermal and metabolic measurements on a reindeer at rest and in exercise.

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Abstract: Adaptations which equip a mammal to cope with the cold stresses of the Arctic environment must at the same time be accompanied by responses which enable it to dissipate large quantities of heat produced during exercise. Some aspects of the heat producing and heat dissipating mechanisms were investigated in the reindeer, an example of a large well adapted Arctic mammal. The oxygen consumption of a reindeer while standing quietly was 606 ml/minute; while pulling a heavily loaded sled, 2390 ml/minute. The evaporative heat loss from the respiratory tract of a standing reindeer was 12 kcal/hour, or seven percent of the heat production; of a vigorously exercising reindeer, 130 kcal/hour, or 20 percent of the heat production. The temperature of the air expired at the nostril was as low as 14° C when the reindeer was standing in a wind at -16° C, and about 30° C at ambient temperatures near 0° C. After the animal exercised, the nostril temperature was 35° to 37° C. The heat production of the rumen ingesta was found to be as high as 0.09 kcal/hour per kilogram of body weight soon after feeding, or 5% to 10% of the basal heat production. The average surface temperature of the thinly furred parts of the reindeer was 5° to 11° C above ambient temperature, the hoof temperature 5° to 9° above ambient and the thickly furred parts only 2° to 4° C above ambient when the reindeer was conserving heat during rest. On the other hand, during vigorous exercise the thinly furred surface was 18° to 22° C above ambient temperature, the hoof was 21° to 28° C above ambient, and the thickly furred surfaces 12° to 15° C above ambient.

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