

## Factors regulating energy expenditure and heat balance in reindeer

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Reindeer are able to maintain a thermogradient between body core and the environment of up to 100°C. This is in part due to prime insulation by fur (Hammel, 1955; Moote, 1955), controlled peripheral cooling by means of counter-current vascular heat exchange in the legs (Irving & Krog, 1955) and counter-current vascular heat exchange in the nasal passages (Blix & Johnsen, 1983). By such protective means the lower critical temperature of the Svalbard reindeer, for instance, is as low as -50°C in winter, when resting metabolic rate is only 66% of the summer value (Nilssen *et al.*, 1984). The seasonal changes in metabolic rate are hardly a result of reduction of basal metabolic rate, but are rather due to seasonal changes in food intake which in turn is determined by seasonal changes in appetite, regulated by photo-period (Nilssen *et al.*, 1984). In reindeer with prime winter insulation and few avenues of heat loss grave thermal problems are incurred when the animal is forced to run to avoid predators, since a trotting speed of only 10 km·h<sup>-1</sup> increases metabolic rate some 4 times (Nilssen *et al.*, 1984; Fancy & White, 1986). In such situations skin temperature is brought close to core temperature, allowing heat to be dissipated through the fur, and the counter-current vascular heat exchange in legs and nose eliminated (Johnsen *et al.*, 1985, Folkow & Mercer, in press). Moreover, the vascular heat exchanger in the nose is now operated in conjunction with a carotid rete for selective cooling of the brain, while heat is stored in the rest of the body (Johnsen *et al.*, 1985).

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