International Journal of Primatology, Vol. 20, No. 4, 1999

Body Temperature Changes in Free-ranging Baboons (*Papio hamadryas ursinus*) in the Namib Desert, Namibia

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Received March 9, 1998; revision May 14, 1998; accepted January 11, 1999

We surgically implanted temperature sensitive telemeters intraperitonealy in free-ranging baboons. Thereafter, we recorded body temperature changes while the baboons were free-ranging and under visual observation. Two distinct patterns of daily body temperature fluctuations occurred; they were related to the availability of drinking water. Core body temperature fluctuated by as much as 5.3°C and regularly exceeded 41°C. Behavioral adaptations of the baboons, notably sandbathing, appeared to be associated with the regulation of body temperature.

KEY WORDS: Baboons; desert environment; temperature telemetry; body temperature.

INTRODUCTION

No primate, other than human beings, has colonized so wide a range of habitats as the baboon. Baboon habitats include tropical forests, savannas and arid deserts. Most studies of adaptations to such diverse habitats are concentrated on the habitat extremes (Kummer, 1968; Whiten *et al.*, 1987) and predominantly arid and semiarid environments (Hamilton, 1985; Sigg and Stolba, 1981; Brain, 1990; Zurovsky and Shkolnik, 1982). An obvious stress to animals living in African arid and semiarid environments is daytime heat. A central theme of these studies is baboon thermoregulation (Stelzner and Hausfater, 1987). While behavioral adaptations of baboons to thermal stress are documented under free-ranging natural conditions (Stelzner and Hausfater, 1987; Stelzner, 1988), data on actual body

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0164-0291/99/0800-0585$16.00/0

temperature changes are absent for baboons or any other nonhuman primate under free-ranging natural conditions.

Present understanding of baboon temperature regulation based on changes in body temperature is derived exclusively from captive animals in laboratory or enclosure studies (Funkhouser *et al.*, 1967; Hiley, 1976; Adair, 1977; Muller *et al.*, 1982; Dahl and Smith, 1985). The mass of adult baboons (15–35 kg) inhibits both rapid passive heat dissipation (as seen in ground squirrels of mass 90–100 g [Chappell and Bartholomew, 1981]) and extensive heat storage (as seen in the gemsbok of mass > 100 kg [Taylor, 1969]). Little fluctuation (usually <2°C around a mean body temperature of 38°C) in core body temperature is apparent among baboons in the laboratory. For mammals lacking known mechanisms for effective brain cooling (carotid rete), which includes baboons, ready access to water is essential to replace that used for evaporative cooling (Mitchell and Laburn, 1985) in order to prevent compromises in physiological functioning and death (Shibolet *et al.*, 1976). Considering that most mammals of similar mass and activity patterns living alongside baboons in arid habitats have effective brain cooling mechanisms (Schmidt-Nielsen, 1975; Mitchell *et al.*, 1987), the question regarding changes in body temperature tolerated by baboons under natural conditions and their subsequent response to these changes has remained unanswered.

We examined, body temperature changes in baboons under natural conditions, in the lower Kuiseb: the most arid habitat yet recorded for nonhuman primates. The area is characterized by extreme aridity and scarcity of drinking water so that baboons regularly go without drinking for periods between one and 116 days (Brain, 1993). We present telemetric and observational data obtained directly from free-ranging desert baboons. All invasive and surgical procedures in this study were approved by the Animal Ethics Committee of the Medical School of the University of the Witwatersrand, South Africa.

STUDY AREA

The study site is the dry river bed of the Kuiseb River canyon in the central Namib desert, Namibia. The climate there has little seasonal temperature variation. Details of the area and climate were described by Hamilton *et al.* (1976), Brain (1990) and Lancaster *et al.* (1984). Climatic data for the study period (March to July 1992) were recorded at Gobabeb, the nearest first order weather station (23′34 S, 15′03 E) and are in Table I.

METHODS

Body Temperature Telemetry

To obtain direct measurements of body temperature, we surgically implanted temperature sensitive telemeters (148–150 MHz) into the peritoneal cavities of