

## **DIGESTION-RELATED THERMOGENESIS IN PIGEONS**

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The pigeon stores ingested food in its crop during the day and digests during the night. Recently we have found that there is interaction at effector level between shivering and digestion-related thermogenesis. Digestion provides heat that replaces shivering to maintain body temperature at night (Rashotte et al. 1999). We suggested that a body temperature ( $T_b$ ) value for nocturnal plateau is set according to energy status to be read in certain time window of each daily cycle. Still open remained the question, whether pigeons are able to control the proper timing of digestion during the day and night, and whether digestion provides heat to be adjusted optimally according to thermoregulation and energy balance. We recorded telemetrically  $T_b$  and locomotor activity of pigeons both at  $T_a$  22°C or 5°C under 12L:12D photoperiod. Mini-Mitter transmitters (Model VM-FH) were implanted under isoflurane anaesthesia, 5 % for induction and 1.5-2 % for maintenance. The pigeons were treated with buprenorphine postoperatively for 24 hours. Rate of digestion was estimated by recording continuously dropping mass accumulation on a load cell. Food was given in one-hour-pulse either two hours after lights on in the morning, or three hours before lights off in the evening. Total fresh and dry mass of excreta within a day was measured. Daily rhythm of excretion had a significant variation according to a signal analysis. The peak value at 22°C appears to be during the first hour of photophase both with morning and evening pulse birds, which indicates digestion at late dark phase. The evening pulse birds excreted more at night than the birds fed in the morning. At 5°C the excretion peak during the first photophase hour disappeared. Again, evening pulse birds excreted more at night than during the day. Significant excretion difference between  $T_a$ 's was found only with morning pulse birds ( $p < 0.05$ ). Pigeons had a clear diurnal  $T_b$  rhythm. The lowest values of 38.5-39.0°C occur at midnight, and the peak values of 41-42°C during feeding sessions were observed. The total daily dropping mass was 20.1 g with morning pulse pigeons and 25.2 g with evening pulse pigeons, and water content of droppings were 14.6 g and 19.1 g, respectively. Regulatory interaction of shivering and digestion-related thermogenesis in pigeons is supported by the present finding of similar digestion timing at late dark phase, independent on time of food pulse and thermal load, and previous evidence for food retention in the crop.

Rashotte, M.E., Saarela, S., Henderson, R.P. & Hohtola, E. (1999) Shivering and digestion-related thermogenesis in pigeons during the dark phase. *Am. J. Physiol.* 277:R1579-R1587.

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