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## Body Temperature Relations in Suckling Hedgehogs

TEMPERATURA CIAŁA U ROSNĄCYCH JEŻY

HELGE WALHOVD

Walhovd H., 1981: Body temperature relations in suckling hedgehogs. Acta theriol., 26, 34: 499—503 [With 2 Tables].

Young hedgehogs, (n=136) *Erinaceus europaeus* Linnaeus, 1758 (body weight 20—240 g), were discovered while astray from their breeding nests. The state and the behaviour of the young indicated that they had been accidently separated from maternal care. During the subsequent period of human care 88 survived while 48 succumbed, some due to blowfly myiasis. When first found, the young hedgehogs were described as "unconscious and cold" or "not willing to take offered food". The oral temperature in 11 cases was within the normothermic range between 31.5—34.0°C. In 14 others the body temperature ranged between 17.5—21.0°C, a clearly hypothermic state. It is discussed how animals in this situation may enter a state of summer torpor.

[Zoological Laboratory, University of Aarhus, DK-8000 Aarhus C, Denmark].

### 1. INTRODUCTION

The postnatal development of temperature regulation has been studied in some species of mammals. Eisentraut (1935) investigated the thermolability in a litter of 7 young hedgehogs during their first month of life. The present paper deals with observations and measu-

rements made on young hedgehogs collected in nature separated from their breeding nests. At the time of collection their behaviour clearly indicated various degrees of hypothermia.

## 2. MATERIAL AND METHODS

In 1976—77 the Zoological Laboratory at Aarhus University made a nationwide inquiry, via public news media regarding the breeding habits of the hedgehog in Denmark. The information obtained concerned nearly 600 hedgehog litters constituting some 3000 young hedgehogs. In some cases the young hedgehogs were collected while astray from their breeding nests, possibly motherless or abandoned (cf. Table 1). When such discoveries were reported instructions on care and management of the young were given. It was recommended that the animals ought to be artificially heated for at least 5 hours before any feeding was attempted. (An electric heating pad-set at 20 W, surface temperature 37°C, proved most useful). Information on the fate of 111 of these young was obtained through a special questionnaire during the winter 1977/78.

Table 1
Information on 111 young hedgehogs, presumably motherless, found crawling or lying outside the nest, and subsequently in the care of 37 various reporters.

| Period | Number | | | Body weight, g | |
|---|---|---|---|---|---|
| | Total | Survived | Died | Initial[1] | Final[2] |
| Aug. 5—15 | 23 | 12 | 11 | 20—100 | 450—950 |
| Aug. 16—31 | 52 | 37 | 15 | 40—125 | 160—625 |
| Sept. 1—15 | 27 | 14 | 13 | 70—150 | 200—750 |
| Sept. 16—30 | 5 | 5 | 0 | 80—140 | 280—380 |
| Oct. 6 | 4 | 2[3] | 2 | 104—106 | 960—985 |
| Aug. 5 — Oct. 6 | 111 | 70 | 41 | 20—150 | 160—985 |

[1] 97 young weighed; [2] 64 young weighed; [3] Reared by the author.

In 1978 and 1979 25 young hedgehogs, found under circumstances similar to those listed in Table 1, were subsequently brought to our laboratory. The body temperature of these hedgehogs was measured on arrival in the laboratory and again 5 hours later after artificial heating of some of the juvenile specimens (cf. Table 2). The body temperature was measured orally using copper constantan thermocouples and a recorder (Ellab Z 94-B). The accuracy of the temperature measurements was ± 0.5°C.

## 3. RESULTS

In 15 reported cases the young were found in groups of 4 to 8 specimens, presumably consisting of complete litters and comprising altogether 85 animals. One of these litters (Table 2, litter no. 1), originally consisting of 6 young with their mother was brought to our laboratory within an hour after an accidental destruction of the breeding nest. The rest of the young was generally found as solitary individuals (Tables 1 and 2).

The state of the reported animals was frequently described as "unconscious", "cold" or "not willing to take food". Inspections made

by the author on 25 juvenile specimens confirmed this desccription in 14 cases. The body temperature of these individuals when first recorded ranged between 17.5—21.0°C, values slightly higher than the prevailing ambient temperatures (Table 2). In 11 young the measured values ranged between 31.5—34.0°C and these animals showed a behaviour like normothermic hedgehogs. The hypothermic young specimens however, typically remained immobile and partly curled up for long periods. Occasionally they stretched their bodies and attempted brief spells of crawling about, sniffing their way in a searching manner but with their eyes closed.

Survival of the reported animals (Table 1) appeared to depend on continued use of artificial heating. When the heating was switched off, the young were reported to enter dormancy and did not accept offered food. Altogether 70 of these young survived. Of the 25 young examined in the laboratory (Table 2) 18 survived. Among the dead 20 had been afflicted with blowfly myiasis.

Table 2

The body temperature of 25 young hedgehogs when received in the laboratory and 5 hours later, respectively.

| Date | Hedgehog, No. | Litter, No. | Body weight, g | Body temperature, C° Initial | Final |
|---|---|---|---|---|---|
| Aug. 11 | 1—5 | 1 | 75 | 32.0 | |
| Aug. 28 | 6 | 2 | 130 | 33.5 | 33.5 |
| Aug. 28 | 7[1], 8[1] | 2 | 119, 120 | 20.0, 20.5 | |
| Aug. 31 | 9[1], 10[1] | 3 | 91, 92 | 17.5 | |
| Sept. 1 | 11[1], 12[1], 13[1] | 4 | 35, 54, 58 | 19.0, 19.5, 19.0 | |
| Sept. 2 | 14, 15 | 5 | 130 | 32.0, 34.0 | 32.0, 34.0 |
| Sept. 20 | 16 | 6 | 135 | 17.5 | |
| Oct. 1 | 17 | 7 | 150 | 19.5 | 31.5 |
| Oct. 2 | 18 | 8 | 240 | 34.0 | 34.0 |
| Oct. 6 | 19, 20, 21, 22 | 9 | 115—150 | 19.0, 19.0, 20.0, 21.0 | |
| Oct. 9 | 23 | 10 | 119 | 21.0 | |
| Cct. 18 | 24 | 11 | 217 | 33.0 | 33.0 |
| Oct. 23 | 25 | 12 | 155 | 32.5 | 32.5 |

[1] Did not survive.

The initial body weight of the young ranged between 20 and 240 g (Table 1 and 2), 115 specimens weighed 100 g or less. Among the fatalities 35 specimens weighed 70 g or less. The survivors were generally among the heaviest specimens. However, one young initially weighing only 30 g, was successfully nursed to complete recovery. The growth rate of the young was generally rapid. Two controlled specimens increased their body weight 14 g per day between October 6 and December 9 (Table 1).

## 4. DISCUSSION

If not subject to human care the 88 surviving young would probably have succumbed, due to natural predation, cold, starvation or blowfly

myiasis (Nielsen *et al.*, 19788. The body temperature of 5 young (Table 2, litter no. 1) and of another 7 was very similar previously recorded values in suckling hedgehogs in the nest age (Eisentraut, 1935), and slightly below values reported for normothermic adult specimens (Suomalainen & Suvanto, 1953; Hildwein & Malan, 1970; Shkolnik & Schmidt-Nielsen, 1976).

The ability of young mammals to control their body temperature, in altricial species has frequently been demonstrated to coincide with the time of nest departure (*e.g.*, Pucek, 1958). Young hedgehogs depart their nest at an age of 19—24 days at which time their incisor teeth usually appear and the first meal of solid food is taken, their body weight being 110—200 g (Herter, 1938: 154—157; Morris, 1967: 485).

The age of the hedgehogs reported in this survey (Tables 1 and 2) cannot be given with certainty because the size of young at birth and during their first weeks of life varies greatly (Morris, 1967: 485). However, it may be safely concluded that more than hundred of the young were between one and three weeks old and thus dependent on nest dwelling (Eisentraut, 1935; Herter, 1938: 154).

The behaviour of the reported young when first discovered (Table 1) and the development of the surviving individuals in response to artificial heating indicated that they initially were hypothermic. This assumption was later confirmed when measurements demonstrated hypothermia in 14 cases among young brought to our laboratory (Table 2). The depressed body temperature might be due to the age of the young since the physiological ability of thermoregulation in the hedgehog chiefly develops during the two first weeks of life, being fully developed at an age of 27—31 days (Eisentraut, 1935).

However, the hypothermic state also could be the result of abnormal social conditions and lack of natural parental care due to accidental killing. With the loss of their mother the unweaned young were deprived of food. The reported and the observed behaviour of of the surviving young, *i.e.*, anorexia upon discovery, and a reappearing appetite following a few hours of artificial heating, suggest that these animals had a depressed body temperature due to starvation. This suggestjon seems natural because in some other hibernators food deprivation invariably induces torpor, and starvation has been demonstrated to be a releasing factor for hibernation and estivation throughout the year (Bartholomew & Cade, 1957; Mrosovsky & Barnes, 1974). Even in starving, adult hedgehogs an increased propensity to "sleep" in winter (Herter, 1934), and to show depressed body temperatures and respiration in summer (Mimachi & Weinland, 1911) have been demostrated experimentally. Considering the young in which body temperature was presently measured (Table 2) it is noteworthy that some individuals were normothermic on arrival to our laboratory. For instance, nos. 6, 14 and 15 are known to have lost 20—70 g in body weight during the 5—6 days between discovery (200 km away) and when the measurements were carried out. These observations suggest that in summer as in winter (Walhovd, 1975 and 1978) juvenile hedgehogs at least in periods maintain the normothermic state despite starvation and low environmental temperatures. This situation however, does not exclude the possibility that some of

the young, initially recorded to be normothermic (Table 2), earlier had a depressed body temperature, *i.e.*, that the European hedgehog may have the ability of undergoing periods of summer dormancy such as also demonstrated for some other hibernating mammals (*e.g.*, Bartholomew & Cade, 1957; Johansen & Krog, 1959; Mrosovsky & Barnes, 1974).

This hypothesis is to be tested in future studies, involving measurements of metabolic rate of suckling young and of adult hedgehogs in relation to experimental starvation.

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