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DEVELOPMENT OF TEMPERATURE REGULATION IN THE FAT DORMOUSE

KSZTAŁTOWANIE SIĘ TEMPERATURY CIAŁA U POPIELICY

The body temperature of the dormouse at the age of 4—6 days averages 32.6 — 32.4°C, and at 22 days, 35.1°C. This means an increase of temperature by 0.17° per day on the average. Between 22nd and 28th days of life this index is equal to 0.05°C per day. One month old dormice already show stabilization of body temperature, being equal to 35.5°C on the average. Resistance to cooling develops during the first three weeks of life and is always higher when studied in whole litters in comparison with single individuals.

The body temperature of adult fat dormice, *Glis glis* (L i n n a e u s, 1766), in summer during their activity is equal to 35.5°C on the average (E i s e n t r a u t, 1956), and thus is lower than in non-hibernating rodents. In nesting dormice the body temperature (*BT*) has not been determined until now. Since dormice kept under laboratory conditions in the Mammals Research Institute at Białowieża reproduced normally the measurements of *BT* in the period of postnatal development became possible. Moreover, the development of resistance to cooling was also estimated.

MATERIAL AND METHODS

Thirteen individuals derived from 4 litters of unequal size were investigated. Two litters (born in February and March) consisted of 2 individuals, the third (born in March) — of 5 young, and the fourth one (born in May) — of four young dormice. The litters stayed in cages with mothers in a room at 16—18°C. A part of the cage was padded with hay which was used by females to build a nest for newborn.

The body temperature (*BT*) was determined immediately after removing the animals from the nest, always between 9 and 10 a.m. As a rule the measurement was repeated after 2—3 hr stay in the nest. Altogether 259 such measurements were carried out on dormice between the 4th and 35th day of life.

The estimation of resistance to cooling was carried out in the following way: after measuring the initial *BT* the animals were kept singly or in

groups for 15 to 30 min in a glass chamber without nest, and *BT* was recorded every 5 to 10 min. The rate of *BT* decrease characterized the magnitude of resistance to cooling. The temperature of a room in which the dormice were subjected to cooling was 16—18°C.

The *BT* of dormice was measured *per rectum* at a depth of 0.8 cm in younger (up to 16th day of life), or 1.0 cm in older individuals. An electric thermometer type TE3 (Ellab Instruments) with the F6 probe was used. Only in two individuals the *BT* determinations were carried out with a different type of electric thermometer (for description see P u c e k, 1958).

RESULTS AND DISCUSSION

The body temperature of the dormouse depends on age since the lowest value was found in youngest individuals (Fig. 1). At the age of 4—6 days the mean *BT* is 32.6—32.4°C while at 22 days it reaches the value of 35.1°C. Hence the difference between the sixth and twenty-second day of life amounts to 2.7°, indicating that *BT* increases by 0.17° per day on the average. In older dormice some slowing down of the rate of *BT*

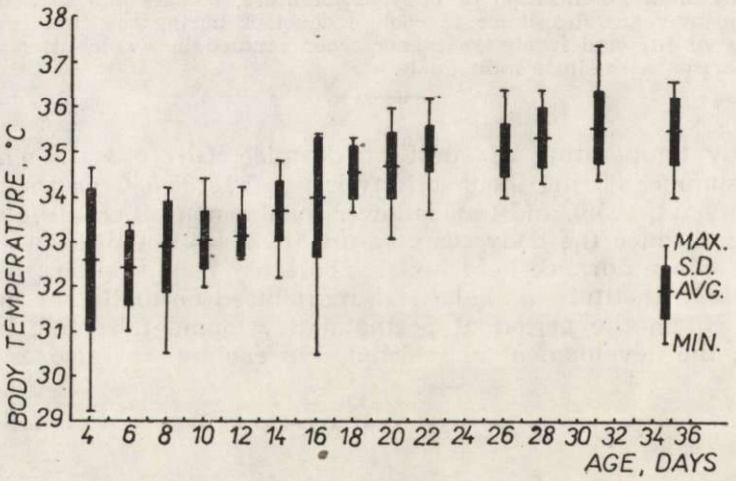

Fig. 1. Body temperature of the dormouse in relation to age.

increase is observed (Fig. 1), and full *BT* stabilization occurs around the age of one month. In 28-day-old animals the mean *BT* value is 35.4°, in 31-day-old — 35.6° and in 35-day-old — 35.5°C. All these values are close to that reported for adult animals (E i s e n t r a u t, 1956).

Nesting dormice are characterized by large differences of *BT*, especially in the youngest individuals. In 4-day-old animals the difference between the highest and lowest recorded value reached as much as 5.4°C. In animals over 16 days the fluctuations are much smaller and are within limits of 2.2—3.0°C (Fig. 1). Nevertheless, in a few cases significant dif-

ferences in *BT* were also observed above this age, *e.g.* 37.4°C in a 31-day-old individual.

In adult individuals the amplitude of variations is slightly smaller but also reaches 2°C. Actual body temperature of adult *Gliridae* depends mainly on their activity (Eisentraut, 1956; Tomilin, 1957; Kayser, 1961). Increased mobility leads to a prompt rise of *BT*. A similar relationship was observed in young individuals and this is responsible for the variability of *BT* despite steady conditions of determinations. For this reason duplicate measurements were carried out at intervals of 2—3 hours.

A marked decrease of *BT* fluctuations with higher age indicates the improvement of thermoregulatory mechanisms. This is also shown by increased resistance to cooling (Fig. 2). In 5-day-old grouped dormice the drop in the *BT* during 15 min amounts to 4.1°C, or 0.27°C per min. Single individuals of the same age decrease their *BT* at the rate

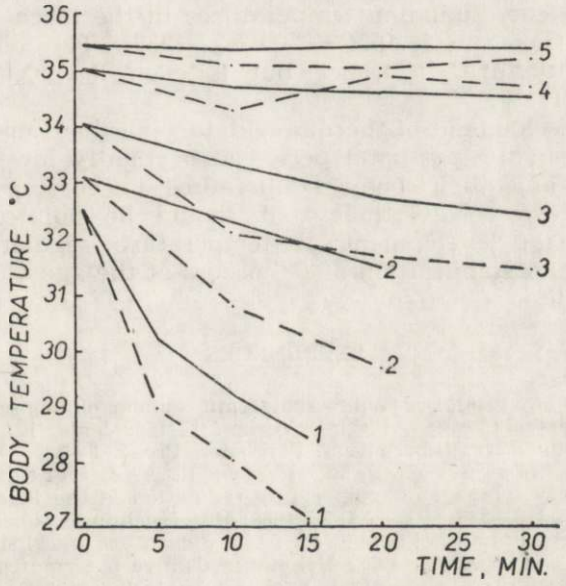

Fig. 2. Rate of lowering of body temperature in dormice of different age kept singly or in whole litters.
Solid line — single individuals, broken line — whole litters. Age of dormice (in days): 1 — 5, 2 — 10, 3 — 16, 4 — 22, 5 — 30.

of 0.37° per min. These indices become clearly reduced in older dormice, and in 10-day-old animals average 0.08° and 0.17° per min, respectively. In both cases there is a striking difference of reaction between single individuals and those kept as a whole litter. This difference is also reduced in older animals. In 16-day-old dormice the values are 0.08° and 0.13° per min, but in 22 and 30-day-old the difference disappears almost completely (Fig. 2). Hence dormice are able to maintain constant *BT* outside the nest at the age of approximately 3 weeks, although the *BT* level is then still lower, for example, than at the age of 28 days.

A similar rate of appearance of resistance to cooling was observed also in another hibernating rodent — the birch mouse, *Sicista betulina* (P u c e k, 1958).

The observed difference in thermal resistance between single individuals and whole litters in relation to age emphasize the importance for young animals of staying in compact groups. This phenomenon allows for a significant reduction of *BT* fluctuations in the youngest individuals showing the weakest thermoregulatory mechanisms.

Also in other, non-hibernating rodents the *BT* of nesting individuals is lower than that of adults. In the postnatal period temperature regulation improves and stabilization of *BT* occurs, as in the dormouse at the age around one month (M o r r i s o n, R y s e r & S t r e c k e r, 1954). However, the rate of development of temperature regulation in these rodents is slightly different than in hibernating rodents. In 10-day-old *Clethrionomys rufocanus dawsoni* the *BT* averaged 35.4°C, in comparison with 38.3°C in adult individuals (M o r r i s o n *et al.*, 1954). On the other hand the corresponding temperatures in the birch mouse of the same age are 35.06 and 36.15°C (P u c e k, 1958). The dormouse shows a similar temperature difference but is even lower, being 31.1° and 35.5°C, respectively.

Hence the development of thermoregulatory mechanisms in hibernating rodents occurs in the postnatal period at a slightly lower rate than in other rodents, and their body temperature in corresponding periods of life is also lower. Nevertheless, it should be pointed out that the general pattern of development of temperature regulation is similar in all rodents, and stabilization of *BT* occurs at the age of approximately one month of life.

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