HIBERNATION IN THE GOLDEN HAMSTER IN RELATION TO AGE AND TO SEASON

by

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INTRODUCTION

When a golden hamster is exposed to a cold environment, it may respond by entering hibernation. A varying number of animals, however, does not hibernate and remains homeothermic (LYMAN, 1954; CHAFFEE, 1966; FREHN & THOMAS, 1969). The results of selective breeding (CHAFFEE, 1966) point to a genetic base for these individual differences in the behavioural response to cold. Not only is there presence vs. absence of the capacity to hibernate but also the phenomenon of good or poor hibernators amongst the individuals of this species.

Apart from the genetic basis for variability, the following indications have been found for season-dependent variations. Golden hamsters, aged 6 or 7 months and adapted to the same conditions of temperature (23°–26° C) and of light (10 hrs light per day), entered hibernation much quicker when transferred to +6° C in September–October than in March–April (DENYES & BAUMBER, 1964). Physiological differences between hamsters in autumn–winter as compared with spring–summer have been demonstrated with regard to lipid metabolism (DENYES & BAUMBER, 1964) and to basal metabolism (PETRASEK, 1957).

We too were struck by the unpredictability and the variability in predisposition to hibernate in this species. In a preliminary note (SMIT-VIS and SMIT, 1963) we proposed an enhanced predisposition to enter hibernation in the months of November to February. This tentative conclusion was based upon observations made on hamsters of both sexes exposed to cold at the ages of 3 to 6 months.

The aim of the present investigation was to study more systematically the capacity to hibernate of male golden hamsters at a known age and kept under standardized environmental conditions, in order to test our assumption and to get a better insight into the phenomenon of hibernation in this species.
Adult male golden hamsters (*Mesocricetus auratus* Waterhouse) were obtained from an inbred strain of the T.N.O. test-animal farm at Zeist (Holland). They had been reared at 20° to 23° C and a photoperiod of about 12 hrs light per day. Immediately after weaning, the animals were randomly selected from the total group of newborn and separately housed. Every first of a month, starting in September 1967, four batches of four animals each, at the ages of 3, 6, 9 and 12 months, respectively, were transferred to a climate room adjusted at +8° (± 0.5°) C and 2 hrs of light per day. This was repeated during the next 11 successive months in the age-groups of 6, 9 and 12 months, and during the next 12 successive months in the case of the 3 months age-group. Food and water were supplied *ad libitum* and hay was given for nest building. The animals were inspected twice a day.

As a measure of the capacity to hibernate the so-called pre-lethargic period, *i.e.*, the number of days between the beginning of cold exposure and the onset of hibernation, was used. A hamster was classified as non-hibernating if it had remained active over a period of at least one year under the experimental conditions. From a total of 196 golden hamsters used, 4 died before and 2 shortly after cold exposure, so that this report is based upon observations made on 190 animals.

For statistical evaluation of the effects of age and of season upon the capacity to hibernate, the test of m-rankings (test of Friedman) was used.

**RESULTS**

A specification is given in Table I of the number of animals per age group and per month, which entered hibernation or, alternatively, which remained active. It is seen that 25 animals (13%) failed to hibernate, while the rest (165 cases) entered hibernation. The failure to hibernate shows some clustering, being roughly more frequent in the age-groups of 9 and 12 months, and especially during spring. The 6-months age group clearly takes an intermediate position between the younger and the older animals.

In Table II and Figure 1 the average lengths of the pre-lethargic period per age group and per month are given. The frequency distribution of the pre-lethargic periods, expressed in 2-weeks periods, is given in Figure 2.

The observations of the hamsters from September 1967 have been disregarded here. As can be seen clearly in Figure 1, the pre-lethargic periods for this month are conspicuously high, whereas the (3-months old) hamsters show much lower values for September 1968. Arguments