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TOLERANCE TO WATER DEPRIVATION IN COMMON HAMSTER

TOLERANCJA CHOMIKA NA ODWODNIENIE

The common hamster, *Cricetus cricetus* (Linnaeus, 1758) occurs in Europe and Asia (Ellerman & Morrison-Scott, 1951), where it inhabits steppes and cultivated fields (Petzsch, 1952). A question arises to a what degree it can be regarded as a steppe animal and what is its water balance. The tolerance to water deprivation in food is believed to be a good test for this characteristic in rodents (German, 1961; Folk, 1966).

Ten hamsters were used for the investigations. They had been caught earlier in southern Poland. The experiment went on during thirty two days from October 14 to November 15, 1971. During this period the animals were kept in a room with the natural daylight at the ambient temperature of 10 to 19°C (average 13.4°C) and the relative humidity of 50—60% (average 55.7%). Four hamsters were kept only on air-dried food consisting of oats and corn (maize). The animals were fed every day and were weighed in two days intervals. The control animals were kept on a normal mixed diet consisting mainly of sappy vegetables (carrot, beet), as well as oats and corn. Water was not given to the control hamsters as these animals do not drink water on the normal diet in the captivity. The non-consumed food was weighed every day in order to estimate the amount of water absorbed by the hamsters from the normal diet. The water content of all sorts of food had been determined by drying it to a constant weight.

After completing the experiment the four hamsters kept on dry food, and five out of those being used as control animals, were subjected to a detailed section. During the section the general status of the animals and their fatness were determined. The kidneys with adrenals, heart, liver, brain and testes or ovaries were excised and weighed accurately. The experimental hamsters were on the average bigger than the control ones and for this reason the initial weight of their internal organs had to be calculated from the regression to the body weight. The regression equations were obtained for the group of control hamsters.

Three of the experimental hamsters survived the whole period (thirty two days) of feeding with air-dried food. The fourth animal died on 27th day of the experiment. Three bigger male-hamsters weighing initially 458 to 550 g were the survivors (Table 1 — animals *B*, *C* and *D*). The female hamster with the initial body weight of 321 g died at the end of the experiment (Table 1 — animal *A*). All the experimental animals lost from 30.7 to 52.4% of their initial body weight.

The animals were constantly losing their body weight during the experimental period, except for two middle days, when the humidity in the animal house increased accidentally (Fig. 1A). The rate of the weight loss

Table 1

Body weight and weights of some internal organs of common hamsters (*A*, *B*, *C*, *D*) kept for 32 days on air-dried food.
The initial weights of the internal organs were calculated from the regression equations for control hamsters.

	A, ♀	*B*, ♂	*C*, ♂	*D*, ♂	Avg. ± S.D.
Body wt.					
Initial	321.0	550.0	518.5	458.0	461.9 ± 101.3
Final	153.5	276.0	359.5	226.0	253.8 ± 86.6
Kindneys					
Initial	2.267	4.191	3.926	3.418	3.450 ± 0.852
Final	1.842	2.195	2.717	2.880	2.408 ± 0.477
Heart					
Initial	1.170	1.903	1.802	1.607	1.621 ± 0.285
Final	0.966	1.167	1.651	1.281	1.266 ± 0.289
Liver					
Initial	9.212	9.693	9.627	9.500	9.508 ± 0.213
Final	5.544	11.939	17.728	14.356	12.392 ± 5.150
Adrenals					
Initial	0.032	0.052	0.050	0.044	0.0445 ± 0.009
Final	0.058	0.043	0.040	0.051	0.048 ± 0.005
Brain					
Initial	2.041	2.407	2.357	2.260	2.266 ± 0.156
Final	2.355	2.245	2.213	2.245	2.264 ± 0.062

was fairly stable during the whole period. In the first week the animals were losing on the average 4.5 to 6.5% of their body weight in every two days; this value decreased to about 4% in the following period (Fig. 1B). At the same time a certain individual variability was observed. The smallest hamster *A* showed the highest rate of the body weight loss; among the remaining bigger males hamster *C* was losing the most slowly its body weight. During the section of hamster *A*, which had died prematurely, a complete lack of the reserve fat was observed. The animals *B* and *D* had very little reserve fat, while hamster *C* had comparatively large amounts of it still left. All the sectioned control hamsters showed abundant reserve fat, both under the skin and in the abdominal cavity. From the comparison of the body weight losses and the fat reserve data of the examined individuals it can be seen that the hamster is able to reduce its body weight even by a half, as long as it has not used up completely its reserve fat.

The estimation of a change of internal organs weight in the animals kept on air-dried food was much more difficult, because these organs could be weighed only during the section after the whole experiment. The

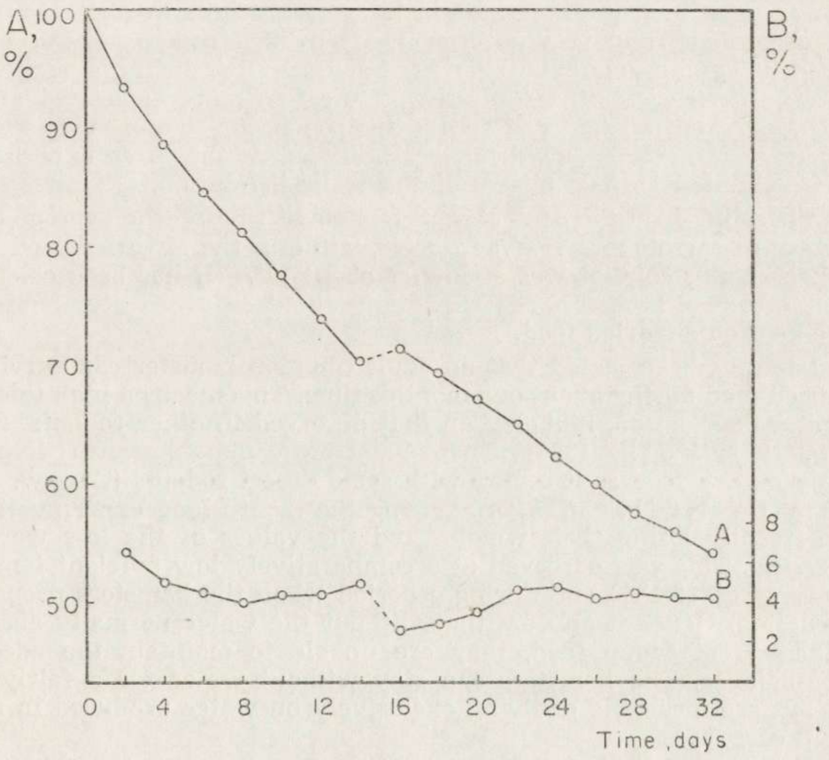

Fig. 1. Changes of body weight in common hamsters kept on air-dry food.
A — Changes of initial body weight in per cent.
B — Relative changes of body weight in two-days intervals (the rate of body weight loss was always calculated in relation to 2 preceding days).

initial weight was interpolated only on the basis of the control hamsters' organs. From the scarce material of the five control hamsters the initial weight of the internal organs was calculated as a function of their body size. These relationships are expressed by the following regression equations:

Kidneys	$Y = -0.428 + 0.0084x$
Heart	$Y = +0.143 + 0.0032x$
Liver	$Y = +8.583 + 0.0021x$
Adrenals	$Y = +0.004 + 0.000088x$
Brain	$Y = +1.528 + 0.0016x$

These equations are more meaningful in the case of kidneys and heart, where the correlation of the weight of these organs with the body weight is fairly high ($r = 0.86$ and 0.54). The initial weights of the organs thus calculated are listed in Table 1, along with the weights determined at the end of the experiment. With the exception of the liver of the hamster *A* that had died earlier, a general trend of the weight changes of the internal organs is similar. The largest weight loss occured with the kidneys (average 28.3%); an appreciable loss has also been found for the heart (average 21.3%). The weight of brain has remained practically unchanged. In contrast to that, the liver weight has increased markedly — by 29.0% on the average, and in the three males by as much as 52.8% on the average. The adrenals have been enlarged by 15% on the average; this, however, resulted from an increase in the two more emaciated animals (*A*, *D*), and from a slight decrease in the remaining two ones. The weight changes of the gonads could not be estimated as the three experimental males exhibited various phases of the testis involution.

In the sappy food the control hamsters could find on the average 88.0% of water in carrots and 79.0% in beets, while in the air-dried food (corn, oats) the water content was as low as about 11%. It has been calculated that the control hamsters adsorbed daily about 20 g of water more than those kept on air-dried food.

It has thus been stated that an adult common hamster can survive on air-dried food during about one month's time. This means a high tolerance to water deprivation, higher than that observed in other rodents (German, 1961; Folk, 1966). These hamsters cannot, however, live constantly on dry food as it occurs with some desert rodents (Chew, 1962; Schmidt-Nielsen, 1964). During the month-long experiment they were steadily losing their weight, and the values of the loss were not decreasing. This was observed at a comparatively low ambient temperature (average 13.4°C) and during a period when the hamsters prepare to hibernation. Hence it appears that without the water normally absorbed by them from sappy food, they are unable to maintain the adequate water balance. The hamsters can stay without water for a fairly long time but are incapable of living exclusively on water produced in metabolic processes.

The common hamster shows a poorer tolerance to water deficit than does the golden hamster, *Mesocricetus auratus* (Waterhouse, 1839) (Folk & Folk, pers. comm.). The geographical distribution of the latter is, however, shifted more to the South, while the common hamster ranges farthest to the North and West from among all hamsters (*Cricetinae*) (Ellerman & Morrison-Scott, 1951).

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A CONVENIENT BAIT FOR SMALL MAMMAL LIVETRAPPING STUDIES

PROSTA PRZYNĘTA DO ODŁOWU DROBNYCH SSAKÓW

Verts (1961) and Smith *et al.* (1969) provided information on baiting snap traps. We found these methods were not suitable for livetrapping where our criteria of an acceptable bait included the following: does not interfere with the treadle operation; does maximize likelihood of animal walking on treadle; can serve as source of energy when animals remain in traps overnight; is easily made; and is efficient to use in the field regardless of season.

For nearly 10 years we have used a bait that meets these criteria. The baits look like large »candy kisses«. Approximately 10 × 10 cm squares of wax paper are cut from a roll using a heavy knife or saw. A teaspoon of peanut butter is applied to the center of a square of wax paper. Other components dictated by study objectives may be added: mixed grains, raisins, bacon grease, cats, or rabbit pellets. The opposite corners of the wax paper are pulled together and twisted to contain the bait. Quantities of baits may be stored frozen until needed.

The twisted end of the bait is easily held in place between the top of the rear door and the roof of a Sherman type trap.

We have used the baits in a variety of habitats in Virginia and Washington in all seasons. Small mammals including *Microtus pennsylvanicus, M. montanus, M. longicaudus, Peromyscus leucopus, P. maniculatus, Reithrodontomys humulis, Tamias striatus, Eutamias amoenus, Glaucomys volans* and various *Sorex* sp. utilize the baits, particularly in winter.

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