SHORT COMMUNICATION

GERBILS PREFER PARTIALLY DARKENED CAGES

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Abstract *Animal Welfare 1995, 4:* 119-123

A test system previously described by Blom et al *(1993) was used to investigate the preference of the Mongolian gerbil (*Meriones unguiculatus*) with respect to light intensity in their cage, by comparing a standard transparent rodent cage with three cages darkened by either 25, 50 or 75 per cent. The ten animals included in the test spent most of their time in the cages that were darkened by 50 and 75 per cent, thus relatively avoiding the standard cage. Preference was mainly determined by visits longer than 15min and was therefore possibly associated with sleeping behaviour. Food and water consumption were not restricted to the preferred cages.*

These results imply that gerbils should be housed preferably in cages that allow sheltering in relatively dark places. For this purpose, placing shelter objects in the cage should be considered.

Keywords: *animal welfare, cages, gerbils, partially darkened, preference test.*

Introduction

Little is known about the housing requirements of gerbils. Laboratory gerbils are usually accommodated in standard laboratory cages with a layer of sawdust bedding. Blom *et al* (1992) have described the use of so-called preference tests in which rodents are offered different housing conditions and their relative preference or avoidance is determined. The authors suggested that the outcome of preference tests can contribute to the optimalization of housing conditions of laboratory rodents and can be used to improve existing guidelines. Blom (1993) showed that rats prefer partially darkened cages. This may be explained by preference for lower light intensities and/or a need for shelter. Like rats, gerbils are burrowing animals, and in the laboratory the Mongolian gerbil, *Meriones unguiculatus* is active throughout 24 hours, with a slight increase in activity during the night (Norris 1987). It can therefore be suggested that gerbils also prefer partially darkened cages. This suggestion was tested in a four-cage preference system.

Materials and methods

Animals

Twelve female Mongolian gerbils, locally bred from a stock originally derived from Bantin and Kingman (Hull, United Kingdom), were used. Prior to the test period they were housed in groups of four animals, in transparent Macrolon type III cages (Uno, Zevenaar, The Netherlands). The supply of food, water and bedding material and room conditions for the test period were identical to those described below.

Preference test

The preference test system used in this study has previously been described by Blom *et al* (1993). The multiple choice housing system consists of four Macrolon type III cages connected by passage tubes to a central cage, allowing the animal a free choice between the cages under investigation. Total dwelling times per cage are assumed to represent relative preference or avoidance. As validation of this system, Blom *et al* (1993) have shown that the comparison of four equal cages results in equivalent total dwelling times and thus equal preference.

In this study, three of the four otherwise identical cages were darkened to different degrees. Each cage that was to be darkened had its sides partially covered with black tape, starting from the side opposite to the entry passage, so as to create a darkened area of either 0, 25, 50 or 75 per cent of the total cage surface. The tops were covered to the same degree as the sides with the use of screens consisting of two perforated (diameter 1.2mm) plates. These plates were placed above one another so that light did not pass but ventilation was retained. Light intensities measured at bedding level at the far side of the cage were 375, 175, 120 and 40 lux for the cages with 0, 25, 50 and 75 per cent darkening, respectively (Blom, 1993).

The four cages were supplied with a known, equal amount of bedding material (Woody Clean 8/15, BMI, Helmond, The Netherlands), food pellets (RMH-B, Hope Farms, Woerden, The Netherlands) and tap water. The bottom of the central cage was equipped with a wire screen with large mesh size to make this cage unattractive. The preference test system was placed in an otherwise empty room with controlled temperature (20–22°C), humidity (40–60%) and light regimen (lights on: 0600–1800h).

Before the actual test, each gerbil was kept in a preference test system with four identical cages for 48 hours to allow the animal to become accustomed to the new environment. Then at 1100h the animal was placed randomly within the central cage of the test system. For a period of 48 hours the animal's whereabouts were registered automatically (see below). After this period, the gerbil was placed back into its former cage. All cages of the test system were cleaned thoroughly with water at 80°C and dried over the weekend. For 11 consecutive weeks this procedure was repeated, turning the testing system 90° clockwise prior to testing another gerbil; this was done to average out any bias caused by the location of the test cages within the testing room. During six of the twelve tests, food and water consumption were measured to serve as an index of animal activity. The bedding, including possible urine and faeces contaminations, was weighed. Shifting of bedding material into the central cage by the gerbils was taken as a measure of digging activity.

Each test cage was mounted on a Sartorius balance (Breukelen, The Netherlands), connected with an Olivetti 292 personal computer (Leiden, The Netherlands). A software programme, developed in-house, monitored the four balances once every second. Balance deflections and arrests were recorded. When no change had occurred since the previous check, no new recording was made. Every change of position of the animal was thus registered and stored on a 20 megabyte hard disk along with the time of registration. The collected data were processed using a spreadsheet programme. When the four balances were simultaneously undeflected the gerbil was considered to be in the central cage. Due to technical error, the data of two gerbils were not complete and had to be excluded from further analysis.

Statistics

Total dwelling times per cage were expressed as a percentage of the total 48 hours testing time. The times spent in the central cage including passage tubes were excluded from statistical analysis. Dark and light periods in the room were analysed separately, each being equivalent to 24 hours. Statistical analysis of the differences in dwelling times between cages was performed with a multivariate repeated measurements test, with cage and photoperiod as main effects. A cage was considered to be preferred when the average dwelling time was more than 23 per cent. A value of 23 per cent would be expected for four equivalent cages, because the central cage was on average visited for 8 per cent of the total time. Food, water and amount of bedding moved, all expressed as grams per cage, were subjected to Student's *t* test with Bonferroni's adaptation (Steel and Torrie 1981).

Results and Discussion

Out of the ten gerbils, none preferred the transparent cage and two chose the cage darkened by 25 per cent. Both the 50 and 75 per cent darkened cages were preferred by four animals each. The preference for the darkest cages is further illustrated by the average dwelling times (Table 1). The multivariate repeated measurements test revealed a significant cage effect ($P<0.001$) when calculated for either the night, day or the total test period. The gerbils spent 60 to 70 per cent of the time in the two most darkened cages. The cage differences in dwelling times associated with preference for partially darkened cages, were mainly determined by continuous visits that were longer than 15min (Table 2). For visits shorter than 15min a statistically significant cage effect was detected but cage differences were relatively small. When cage visits shorter than 5min were registered, no significant cage effect could be observed. For all durations the darkest cage had the highest group mean dwelling time (Table 2). Given the fact that a great deal of the time spent in the preferred cages consisted of longer periods without position changes, it appears that preference was closely associated with sleeping.

Table 1 **Relative dwelling times per cage (means ± SD, n = 10), expressed as percentage of the total test or photoperiod.**

Period	Test cage, per cent of darkening					
	0	25	50	75	Central	MRMT*
day	6.1±2.9	20.5±24.2	33.6±26.4	29.5±26.1	10.3±10.3	$P<0.001$
night	6.8±4.7	19.4±23.6	30.9±28.0	36.1±25.5	6.8±10.3	$P<0.001$
total	6.5±3.5	20.0±23.4	32.3±26.5	32.8±24.4	8.6±10.3	$P<0.001$

* Multivariate repeated measurements test.

Table 2 **Relative dwelling times per cage, expressed as percentage of the total test period for visits shorter than 5 and 15min, and longer than 15min (means ± SD, n = 9).**

Duration	Test cage, per cent of darkening				
	0	25	50	75	MRMT*
< *5min*	15.7±2.3	17.7±3.6	20.6±4.1	25.1±7.5	$P = 0.09$
< *15min*	14.2±3.0	17.5±5.5	20.5±6.3	30.2±8.0	$P = 0.02$
> *15 min*	1.8±4.6	21.1±34.1	34.6±36.7	42.5±38.7	$P = 0.001$

* Multivariate repeated measurements test.

Thiessen *et al* (1968) showed that gerbils prefer dark conditions and avoid light when placed in a novel situation. Our results show that also under familiar, laboratory conditions gerbils do prefer darkness, as shown by avoidance of the transparent cage when compared to identical but partially darkened cages. This could reflect a preference for the lower light intensities and/or a need for shelter.

There was no difference between dwelling times for the dark and light periods. This is surprising because during the dark period, there is no difference in light intensity between the test cages. Possibly, preference during the dark period is determined by that during the light period. It should be noted here that each gerbil was introduced into the preference system during day time. It cannot be excluded that they stayed in the darkest cages initially so these cages became familiar and thus preferred during the dark period.

Table 3 shows food and water consumption and the amount of bedding material moved by the gerbils. The four test cages did not differ significantly with respect to these variables ($P>0.05$). Thus the activities of eating, drinking and shifting of bedding did not correlate with cage preference. During both the light and dark periods the gerbils visited the transparent cage to forage and to dig in the bedding.

Table 3 **Food and water intake and amount of bedding material shifted, expressed in grams (means ± SD, n = 6).**

Period	Test cage, per cent of darkening			
	0	25	50	75
Food	6.0±1.8	6.2±1.9	7.3±2.7	6.5±3.5
Water	6.8±3.7	6.0±2.8	6.0±2.1	12.2±7.6
Bedding	29.8±36.6	27.2±28.2	22.0±21.7	25.5±28.6

Preference testing is often criticized on the basis that an animal is not capable of choosing those conditions that optimize their welfare in the long term. Conclusions must therefore be drawn with care. Cage preference measured in this study was based largely on dwelling periods longer than 15 minutes and therefore was most likely associated with the location of sleeping. Other activities such as eating, drinking and digging were not restricted to the preferred cages. We conclude that gerbils prefer partially darkened cages over transparent cages at least for sleeping, but do not show a clear preference for darkness when active.

Animal welfare implications

Our results show that gerbils prefer darkened cages at least for sleeping, but appear indifferent to cage darkness concerning other activities. The use of either partially darkened cages or the placement in the cage of shelter objects, would allow the animals to choose within their cage at any time between brighter and darker areas, depending on their behavioural needs. We presume that such cage modification enhances the expression of natural behaviour, which will contribute to the well-being of gerbils.

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