

Long Term Group Housing Preference Test with Rats

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Rats are by nature socially compatible animals. Whenever possible rats are pair housed in our facility. Usually, the cage size is sufficient to accommodate two animals. During a long-term study the animals may grow too large to be pair housed in our existing cages, according to the Guide recommended size vs. space requirements. Therefore the animals must be separated and single housed until the end of the study. It is unknown whether or not this change from pair housing to individual housing is stressful to the animals.

A preference was designed to determine if rats would choose to remain together in one cage smaller than the recommended size for their weight or move apart to take advantage of more space. The test cage consisted of two polycarbonate shoebox cages connected together using a 6"x3" polycarbonate tube commonly used as an environmental enrichment item (Rat Tunnel, Bio-Serv, Frenchtown NJ.). Both cages contain the same food, water, bedding and enrichment items. The animals were maintained on a 12 on/12 off light cycle. Six male and four female naïve adult CD rats of various ages, extras from other studies, were obtained. They were double housed in a shoebox cage for at least 4 weeks.

The test cage was placed on two balances (Mettler Toledo) with one shoebox resting on each balance and the tube connecting them. One balance was connected to a computer with software that collected weights automatically at designated intervals and placed them directly onto an Excel spreadsheet (Balancelink v3.0, Mettler Toledo). With this set-up only one side of the test cage was weighed and differences in the weights indicated the presence of 0, 1 or 2 rats in that particular cage. Infrared surveillance cameras were setup to observe activities in each set of test cages. These observations were collected with the use of a time-lapse VCR.

The rats were put into two groups based on their sex. Each pair of males was placed into a test cage. Baseline weights were collected with 2 rats in the weighed half, one rat in each half and both rats in the opposite half of the test cage. The computer was set to collect a weight every minute. The cameras were turned on, and data was collected for 3 days. After the data collection period the males were left in the test cages but placed back on a shelf rack. The two pairs of females were placed in the test cages on the scales. Baseline weights were recorded, cameras turned on and data was collected for 3 days. The females were also left in the test cages and placed on a shelf rack. Three weeks later the data collection process was repeated for both groups. This was altered for the male 3 week observation period as it fell during the holidays and recording time was shortened to 48 hours.

Time spent together or apart was calculated by creating a range based on the baseline weight with one rat in each half of the test cage, for females this range is ~300 grams and for males ~400 grams. Weights above this range signify both rats in the weighed side and numbers below this range signify both rats are in the opposite half. Therefore numbers above and below the range indicate the animals' time together and numbers within the range indicate the animals' time apart.

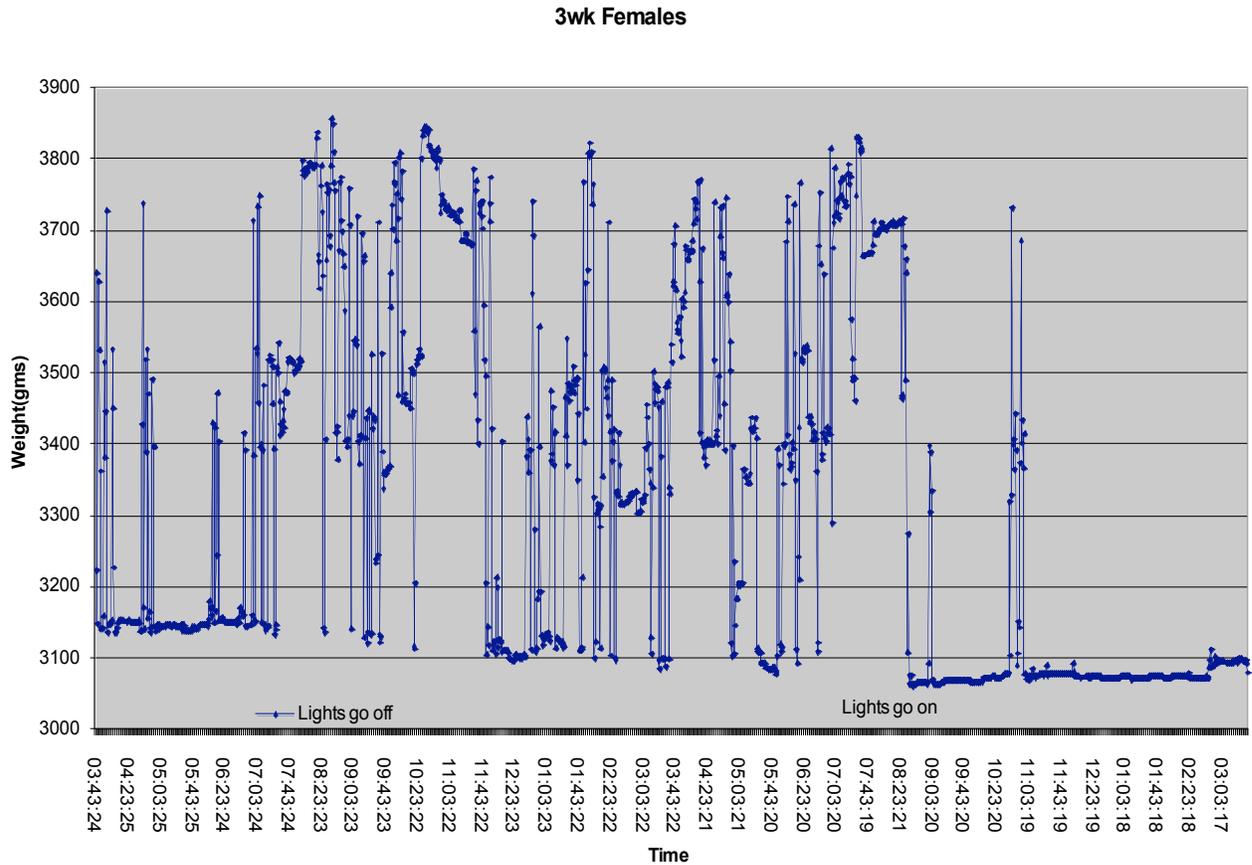
The hypothesis was that the animals would prefer to be together a larger percentage of the time. This proved to be true for the females, who spent an average of 74.82% of the time together. However males only spent 53.89% of the time together. When this was broken down to light and dark periods it was shown that males spent 44.02% of the dark, or active period together and females spend 60.72% of this period together. Males spent 57.63% of the light, or inactive period together and females spent 92.02% of this time together. The males spent a lot of time resting in the tube, sometime both rats squeezed in together. This may have affected the data somewhat giving the appearance that there is a rat in each side and therefore the time spent apart percentage. The females were more likely to rest in the cage corners when they weren't moving.

Females: Percent together		Males: Percent together	
Cage 1	Week 1	Cage 1	Week 1
58.24%	Lights out (ACTIVE)	59.26%	Lights out (ACTIVE)
94.37%	Lights on (SLEEP)	61.93%	Lights on (SLEEP)
Cage 2	Week 1	Cage 2	Week 1
68.01%	Lights out (ACTIVE)	46.90%	Lights out (ACTIVE)
86.96%	Lights on (SLEEP)	50.74%	Lights on (SLEEP)
Cage 1	Week 2	Cage 1	Week 2
50.05%	Lights out (ACTIVE)	43.06%	Lights out (ACTIVE)
91.00%	Lights on (SLEEP)	70.34%	Lights on (SLEEP)
Cage 2	Week 2	Cage 2	Week 2
66.57%	Lights out (ACTIVE)	26.88%	Lights out (ACTIVE)
95.76%	Lights on (SLEEP)	47.53%	Lights on (SLEEP)
60.72%	Average time together and active	44.02%	Average time together and active
92.02%	Average time together and asleep	57.63%	Average time together and asleep

Activity recorded by the cameras along with the weight data indicated that the females were much more active than the males. The females spent a lot of the dark periods traveling back and forth between cages and always settled together within minutes of the lights turning on, whereas the males tended to spend more time in one spot with significantly less travel time and sometimes settled together when the lights turned on.

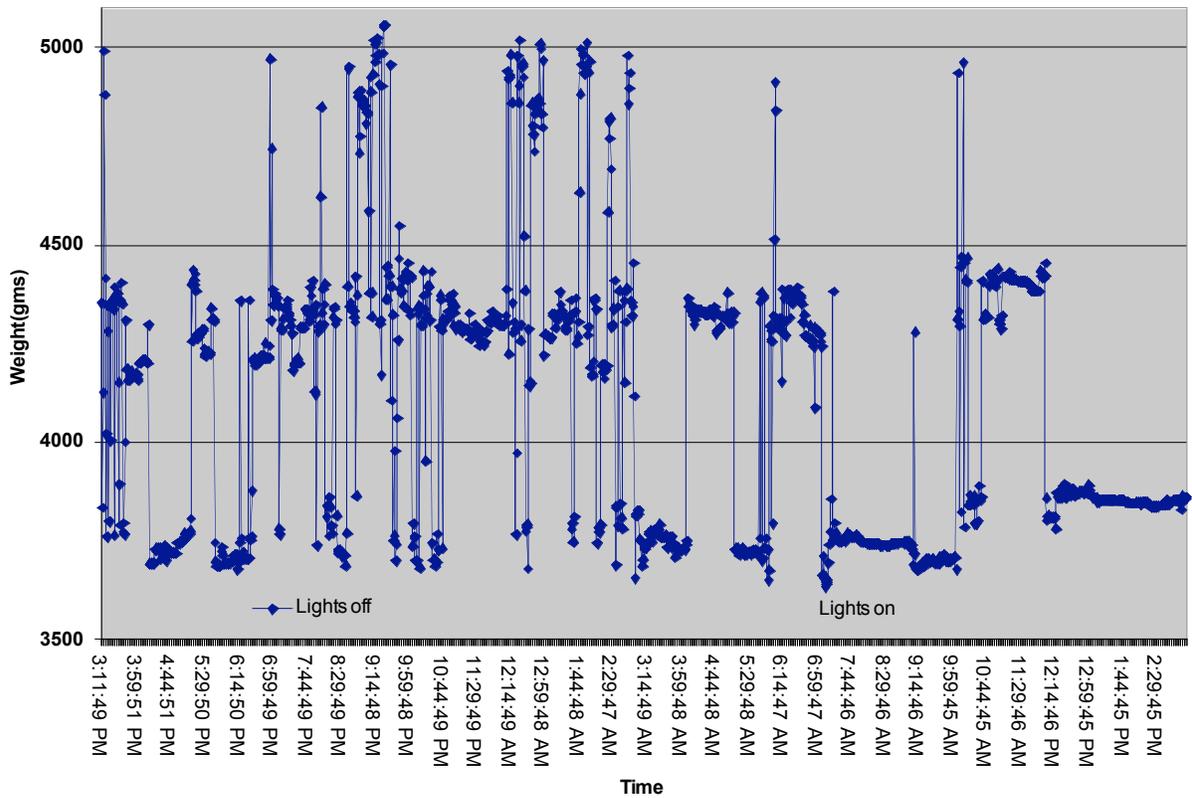
These numbers suggest that older male rats may actually prefer to be single housed, or at minimum, to have a divided cage with room to be apart. The practice of separating them at a certain weight will not change in this facility at this time. It also suggests that females prefer to be together but

may also benefit from a divided cage. As females rarely reach a weight where they would have to be separated this is not an issue.



This chart shows the data for the first 24 hours collected from females at the 3 week time point. It shows significant activity during the dark period and very little activity after the lights go on with both rats remaining in one cage for long periods of time.

3wk Males



This chart shows the data for the first 24 hours collected from the males at the 3 week time point . There is significantly more activity after the lights go on with several position changes throughout the day.