



MEMORY AND HIERARCHICAL BEHAVIOUR IN MICE, RATS AND GUINEA PIGS

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Abstract

A study was conducted to retrieve information on the memory and hierarchical traits in mice, rats and guinea pigs by sequential separations and re-mixing at different time intervals and recording the aggression, dominance and submissive behavioural traits. The results of the study indicated that among the three species of animals studied, guinea pig was found to be the least aggressive. Loss of hair around the mouth due to severe fighting (barbering) was found to be more with mice than rat. Cage stereotypies shown by rats were clinging on the roof of the cage, biting the meshes of the cage and eating the plastic portion of the cage. Constant pacing or circling of the cage, gnawing of the bars were the cage stereotypies shown by mice. Animals of all species established stable, sound hierarchy within 24 h. It was concluded that all the species retained varying levels of memory that lasted for less than a week as indicated by increasing trend of the duration of the aggression in each episode.

Key words: Hierarchy, behaviour, memory

Specific studies on the ethological factors of laboratory animals are scarce and scanty. Knowledge of the behaviour of the rodents has become important from the view of controlling their population for reducing the economic loss and disease problems incurred by them. The knowledge has also been

employed to keep them both physiologically and psychologically healthy, when they are used in research laboratories and also as pets. Rearing in confinement may influence their behavioral traits there by resulting in certain managemental problems in laboratory conditions. Hence the present study was undertaken to retrieve specific information on the memory and hierarchical traits in mice, rats and guinea pigs.

Materials and Methods

Twenty four each of adult female rats, mice and guinea pigs maintained at Kerala Agricultural University Small Animal Breeding Station, Mannuthy belonging to two strains within each species were taken for study. Twelve animals in each strain were housed in separate cages as replicates for two weeks as indicated below:

Mice-Balb/c (C1) and Swiss albino (C2)

Rats-Wistar (C3) and Sprague dawley (C4)

Guinea Pigs-Coloured (C5) and Albino(C 6)

After two weeks, animals in each cage were divided into two groups of six animals each and were housed in separate cages like C1.1, C1.2, C2.1, C2.2, C3.1, C3.2, C4.1, C4.2, C5.1, C5.2, C6.1 and C6.2. One animal from each cage was interchanged to their respective pre- divided cage mates after 1, 2, 3, 4 and 7 days respectively. The frequency and intensity of aggressive behaviour and physical injury were observed for one hour, after transfer. The period required for establishment of stable

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social hierarchy was also noted by using dominance and submissive behavioural sequence in each strain of animal. Specific behavioural manifestations in the cage were also observed during the study period.

Results and Discussion

The results obtained in the study are furnished in Tables 1 to 3 and are discussed hereunder. It was noted that there were episodes of aggressive behaviour in mice the next day after separation and re-mixing. The frequency and duration of aggression increased after four and eight days of separation indicating a memory for less than a day in mice. There was no difference between strains in the intensity of aggression.

Physical injury in the form of barbering was noticed from the fifth day onwards in both strains of mice indicating that, although there

were episodes of aggression, they retrieved the memory soon and fight leading to physical injury was not there. In both the strains at all intervals the social hierarchy was established within 24 h and hence it could be taken as a constant social trait (Table1).

Compared to mice, the frequency of aggressive episodes were more in rats but duration was less. The incidence of physical injury and hierarchy formation were in par with that of mice (Table 2). In this context, Naicy *et al.* (2003) have reported that there was aggressive behaviour between males when there was separation and remixing of groups of male and female rats. Marler and Hamilton (1966) have observed similar pattern in rats. But Ewer (1973) attributed this behaviour as fighting games with crawling under and over each other resulting in smell sharing.

Table 1. Intensity of aggression, physical injury and hierarchy formation observed in mice after interchanging the cages at different periods

Day	Intensity of Aggression		Physical injury		Hierarchy formation	
	C1	C2	C1	C2	C1	C2
2	1 episode of aggression in about 20 min. interval lasted for 2-3 min.	1 episode of aggression in about 20 min. interval lasted for 1-2 min.	Nil	Nil	Established within 24 h.	Established within 24 h.
3	1 episode of aggression in about 20 min. interval lasted for 2-3 min.	1 episode of aggression in about 20 min. interval lasted for 1-2 min.	Nil	Nil	Established within 24 h.	Established within 24 h.
4	1 episode of aggression in about 20 min. interval lasted for 2-3 min.	1 episode of aggression in about 20 min. interval lasted for 1-2 min.	Nil	Nil	Established within 24 h.	Established within 24 h.
5	1 episode of aggression in about 15 min. interval lasted for 3-5 min.	1 episode of aggression in about 15 min. interval lasted for 2-3 min.	• barbering	• barbering	Established within 24 h.	Established within 24 h.
8	1 episode of aggression in about 15 min. interval lasted for 5 min.	1 episode of aggression in about 15 min. interval lasted for 5 min.	• barbering	• barbering	Established within 24 h.	Established within 24 h.

- Loss of hair around mouth area resulting from fight.

Table 2. Intensity of aggression, physical injury and hierarchy formation in rats after interchanging the cages at different periods

Day	Intensity of aggression		Physical injury		Hierarchy formation	
	C3	C4	C3	C4	C3	C4
2	1 episode of aggression in about 15 min. interval lasted for 30 sec.	1 episode of aggression in about 13 min. interval lasted for 30 sec.	Nil	Nil	Established within 24 h.	Established within 24 h.
3	1 episode of aggression in about 15 mts interval lasted for 30 Sec	1 episode of aggression in about 13 mts interval lasted for 30 Sec	Nil	Nil	Established within 24 h.	Established within 24 h.
4	1 episode of aggression in about 15 min. interval lasted for 30 sec.	1 episode of aggression in about 13 min. interval lasted for 30 sec.	Nil	Nil	Established within 24 h.	Established within 24 h.
5	1 episode of aggression in about 10 min. interval lasted for 30sec.1 min.	1 episode of aggression in about 10 min interval lasted for 30sec.1 min.	• barbering	• barbering	Established within 24 h.	Established within 24 h.
8	1 episode of aggression in about 5 min. interval lasted for 1-2 min.	1 episode of aggression in about 5 min. interval lasted for 1-2 min.	• barbering	• barbering	Established within 24 h.	Established within 24 h.

- Loss of hair around mouth area resulting from fight

Table 3. Intensity of aggression, physical injury and hierarchy formation in guinea pigs after interchanging the cages at different periods

Day	Intensity of Aggression		Physical injury		Hierarchy information	
	C5	C6	C5	C6	C5	C6
2	Nil	Nil	Nil	Nil	< 24 h.	< 24 h.
3	Nil	Nil	Nil	Nil	-do-	-do-
4	Nil	Nil	Nil	Nil	-do-	-do-
5	very short episode of aggression lasted for < 5 sec.	1 episode of aggression lasted for < 5 sec.	Nil	Nil	-do-	-do-
8	very short episode of aggression lasted for 5 -10 sec.	1 episode of aggression lasted for 5-10 sec.	Nil	Nil	-do-	-do-

There was no sign of aggression and physical injury on 2nd, 3rd and 4th day of separation and re-mixing in guinea pigs. On 5th day onwards they have started very short episodes of aggression indicating that they possess a memory for about three days. But duration for hierarchy formation was below 24 h (Table 3).

Among the three species of animals studied, guinea pig was found to be the least aggressive. Among the rats and mice species, loss of hair around the mouth due to severe fighting (barbering) was found to be more with mice than rat. Apart from all these behaviors "cage stereotypies" were also shown by the animals especially rats and mice. Cage stereotypies shown by rats were clinging on the roof of the cage, biting the meshes of the cage and eating the plastic portion of the cage. Constant pacing or circling of the cage, gnawing of the bars were the cage stereotypies shown by mice. All of the three species of the

animals established stable sound hierarchy within 24 hours. From this observation it can be reasonably concluded that the rats and mice retained memory for one day and guinea pigs retained memory for three days as indicated by the increasing trend of duration of aggression in each episode.

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