

Copulatory behavior of male house musk shrews (*Suncus murinus*)

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Introduction

It is well known that the ejaculatory reflex in male rats (Murakoshi & Saito 1988, Saito & Moltz 1986), mice (Takahashi *et al.* 1984), hamsters (Yamaguchi & Saito 1987, Yamaguchi *et al.* 1988), voles (Saito *et al.* 1991), and guinea pigs (Kosaka *et al.* 1993) appears after a series of mounts and intromissions of receptive females.

Ejaculation is followed by a period of sexual inactivity, the post-ejaculatory interval, after which copulation may be resumed and eventually another ejaculation achieved. Detailed observation has shown differences in the copulatory pattern among the above rodents (Hokao *et al.* 1993). With regard to ejaculation frequency, for example, male hamsters and rats ejaculated several times an hour, while male mice ejaculated only once a night. The former animals showed the intromission and ejaculation within a few minutes and ten minutes, respectively, the latter did the ejaculation a few hours after introduction of a receptive female. However, very little information is available on the sexual behavior of male and female house musk shrews. The animal is an insectivore and has a variety of characteristic features not seen in rodents such as rats and mice (Tajima 1989). They are reflex ovulators, and mature females are ready to mate with males at any time (Suzuki 1982). The purpose of the present study was to determine the pattern of copulatory behavior in the house musk shrew paired with a female.

Materials and Methods

Animals

The animals used were 28 Jic: SUN strain (Matsuzaki *et al.* 1992) house musk shrews of both sexes reproduced and reared in closed colonies at

the Central Research Laboratory for Experimental Animals (Kanagawa, Japan). These animals had been reared at a room temperature of 20-25°C and 40-60% humidity, with lighting for 12 hrs/day (between 07:00 and 19:00). They were maintained on a standard laboratory pelleted diet for house musk shrews (CIEA-305, CIEA Japan, Inc., Tokyo, Japan) and tap water. They were continuously allowed free access to the pellets and water.

Behavioral testing: On reaching the age of 10-12 months, 14 males (60-75 g) were subjected to copulatory behavior testing. One half of these males were observed for the 2 hrs between 09:00-11:00, the remaining one-half were observed for the 2 hrs between 20:00-22:00 with illumination by a red lamp (6 W). A male house musk shrew was housed in an observation cage first (radius X height, 24 X 36 cm) (Figure 1). Five minutes later, a female house musk shrew aged 8-10 months (40-45 g) was introduced into the cage. Copulatory behaviors were quantitatively expressed by using the following variables:

1. Mounting frequency (MF): Number of mounts without intromission during 2 hrs.
2. Intromission frequency (IF): Number of mounts with intromission during 2 hrs.
3. Ejaculation frequency (EF): Number of ejaculations during 2 hrs.
4. Mount latency (ML): Elapsed time between introduction of the female and the first display of mounting.
5. Intromission latency (IL): Elapsed time between introduction of the female and the first display of intromission.

5. Ejaculation latency (EL): Elapsed time from first intromission of the female to time of ejaculation.
6. Hit rate (HR): $IF/(MF+IF)$
7. Inter-intromission interval (III): Intervals between successive intromissions (EL/IF).
8. Statistical analysis: The data were analyzed by use of the Mann-Whitney U test (Mann & Whitney 1947).

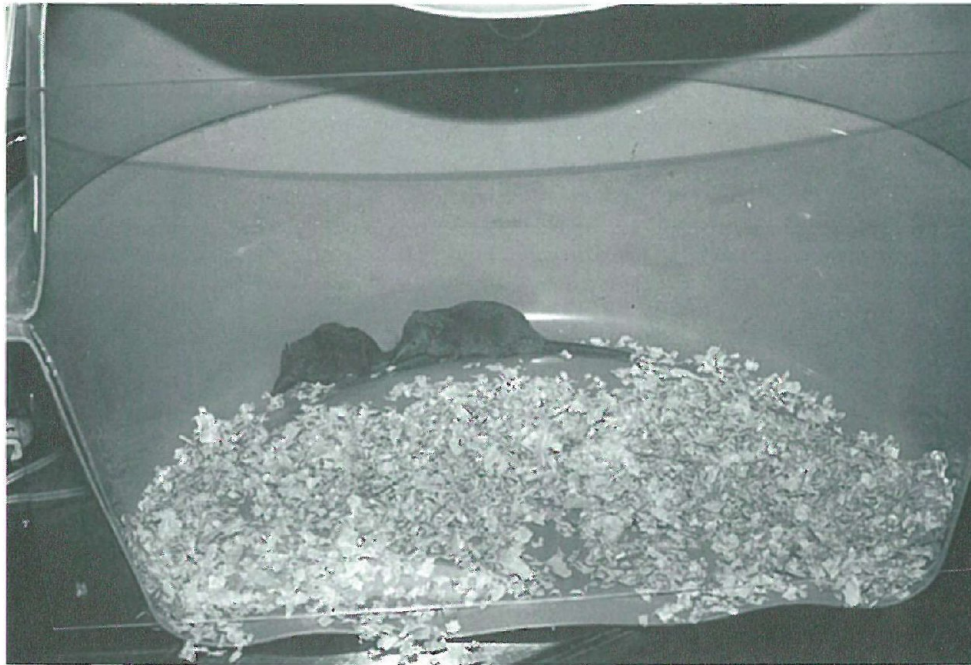


Figure 1. Observation cage for sexual behavior in house musk shrews.

Results and Discussion

Table 1 shows the frequencies of mounting, intromission, and ejaculation during 2 hours, as well as the hit rate of male house musk shrews put in the light (09:00-11:00) or dark (20:00-22:00) periods. All 14 males ejaculated once within 2 hours in the light or dark periods. The median numbers of mounts, intromissions and ejaculations in the light period were 35, 5 and 1, respectively. These values were similar to those in the dark period. Reflecting the above, there was no significant difference in the hit rate between the light and dark periods. Table 2 shows the latencies of mounting, intromission, and ejaculation, as well as the inter-intromission interval of male house musk shrews accommodated in the light and dark peri-

ods. The ejaculation latency tended to be lower in males accommodated in the light than that of males accommodated in the dark periods, although this difference was not statistically significant. Other parameters were similar in the two groups. In summary, the following can be said about the pattern of copulation in male house musk shrews paired with females. Firstly, the pattern of copulatory behavior observed in the light period is similar to that observed in the dark period. The similarity may result from reflex ovulation in house musk shrews. Secondly, the number of ejaculations within 2 hours is similar to that in guinea pigs (Kosaka *et al.* 1993). And finally, we do know that every male in the present study was

eventually aroused by the female and thereafter ejaculated and fathered viable young.

Summary

The copulatory behavior in male house musk shrews (Jic: SUN strain) aged 10-12 months was observed under the light (09:00-11:00) and dark (20:00-22:00) periods. The females of same strain were used as stimulus in copulatory behavior tests.

Two-hour test sessions were recorded. All 14 males showed one ejaculation after a few intromissions within 2 hours. These values are similar to that of male guinea pigs. Comparing behavioral frequencies and latencies for males observed in the light and dark periods, there were no significant differences between two groups. The present study is the first to clearly establish the pattern of copulatory behavior in male house musk shrews.

Table 1. Comparison of behavioral frequencies for male house musk shrews in the light and dark periods

Mating period	n	No. of Mounts/2 hrs	% ^{a)}	No. of Intromissions/2 hrs	%	No. of Ejaculations/2 hrs	%	Hit rate
Light (0900-1100)	7	35(5-54) ^{b)}	100	5(2-26)	100	1 (1-1)	100	0.25(0.08-0.41)
Dark (2000-2200)	7	24(8-208)	100	5(2-22)	100	1 (1-1)	100	0.20(0.08-0.43)
P value ^{c)}		ns ^{d)}	ns	ns	ns	ns	ns	ns

a)Percent of animals responding

b)Median (Range)

c)Determined by Mann-Whitney U test

d)Not significant

Table 2. Comparison of behavioral latencies for male house musk shrews in the light and dark periods

Mating period	n	Mount latency ^{a)}	Intromission latency	Ejaculation latency	Interintromission interval
Light (0900-1100)	7	555(87-894) ^{b)}	984(207-3270)	351(126-1464)	63(18-289)
Dark (2000-2200)	7	404(146-704)	1092(426-5424)	1460(149-4758)	133(31-377)
P value ^{c)}		ns ^{d)}	ns	ns	ns

a)Latency (or interval) in seconds

b)Median (Range)

c)Determined by Mann-Whitney U test

d)Not significant

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