

## Short Note

### Variations in the Sexual Performance in Old Male Rats

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**Yuan-Feen Tsai, Houg-Wei Tsai and Mei-Yun Tai (1994)** Variations in the sexual performance in old male rats. *Zoological Studies* 33(3): 232-234. Progressively reduced copulatory behavior with age has been reported for male rats. In the present study, the sexual behavior of 197 old male rats (18-19 months) was investigated and four types of behavioral performance observed. Some subjects (16%) displayed the complete copulatory patterns, including mounts, intromissions, and ejaculations (Group A). Others (36%) exhibited mounts and intromissions but no ejaculation (Group B). Only 6% of the subjects exhibited mounts and did not show intromission or ejaculation (Group C). Most subjects (42%) did not exhibit any copulatory behavior (Group D). Comparisons of observed behavioral items among the four groups rendered significant differences ( $p < 0.005$ ). An exception to this was the first mount data of Groups B and C. These results suggest that at least four qualitatively different types of male sexual performance exist in old rats.

**Key words:** Sexual behavior, Male rat, Age.

Copulatory behavior in male rats declines progressively with age (Larsson 1958, Gray et al. 1981, Chambers and Phoenix 1984, Hsu et al. 1986, Smith et al. 1992). However, little is known about individual variations in the sexual behavior of older rats. We have observed previously that some old male rats fail to exhibit sexual behavior; whereas, others of the same age are still able to exhibit the complete copulatory pattern, including mounts, intromissions, and ejaculations (Tsai et al. 1991). Therefore, the present study was undertaken to qualitatively examine and classify sexual performance among aged male rats.

**Materials and Methods**—In the present study, 197 old (18-19 months) and 46 young (4-5 months) sexually experienced male Long-Evans rats were used. Animals were housed in a temperature-controlled room with a reversed 14:10 hr light:dark cycle (lights on 2000 hours), and were allowed free access to food and water. All subjects had on various occasions served as breeders or as sexual partners in experiments on female sexual behavior. Before the initiation of the present study all animals had rested for approximately 6 months. All young rats at the age of 3 months were used only once as sexual partners.

In sexual behavior test, the test area of the animal room was dimly illuminated by a red bulb lamp. We placed each subject into a 45 × 35 × 35 cm plexiglas testing chamber and allowed them a 5 min habituation period. After the habituation period, two sexually receptive young (3-5 months) female rats which had been ovariectomized and implanted subcutaneously with a 5 mm estradiol benzoate-filled silastic capsule were placed in the chamber. Both females were replaced by others every 15 min to prevent the male from becoming bored by exposure to the same female partners. The tests were begun at 1300 hours and the observation period lasted 30 min for

each male rat. Six copulatory behavior tests for old rats and three for young ones were carried out at 5 day intervals. For all behavioral tests we calculated the average number of mounts, intromissions, and ejaculations in a 30 min observation period as the mount frequency (MF), intromission frequency (IF), and ejaculation frequency (EF). Latency to the first mount (ML), first intromission (IL), or first ejaculation (EL) was computed as the time from the beginning of the test until the first occurrence of the given response. Data were analyzed with Kruskal-Wallis one way analysis of variance by ranks and the Mann-Whitney U test.

**Results and Discussion**—On the basis of the presence of specific male copulatory behavior components during a total observation period of 180 min (6 behavioral tests, 30 min per test), as shown in Table 1, four types of sexual performance were observed among old rats. Some old rats (16%) displayed the complete copulatory pattern, including mounts, intromissions, and ejaculations (Group A). Other subjects (36%) exhibited mounts and intromissions but no ejaculation (Group B). Only 6% of the subjects exhibited mounts with an absence of intromission or ejaculation (Group C). Finally, most subjects (42%) did not exhibit any copulatory activities throughout all six behavioral tests (Group D). Since comparisons of all the behavioral items observed among the four groups revealed significant differences ( $p < 0.005$ ) except for the ML value for Groups B and C; at least four qualitatively different types of male sexual performance is suggested for old rats.

In contrast, young rats were classified into only two groups under the same behavioral criteria for old rats and the total observation period was reduced to 90 min (3 behavioral tests, 30 min per test). About sixty percent of the young animals displayed mounts, intromissions, and ejaculations (Group E);

**Table 1.** Types of copulatory performance in old and young male rats

Group	Age (month)	n	MF	IF	EF	ML (sec)	IL (sec)	EL (sec)
A	18-19	32	35.6 ± 2.1 <sup>abc</sup>	9.8 ± 0.7 <sup>ac</sup>	0.38 ± 0.06 <sup>c</sup>	218 ± 53 <sup>abc</sup>	441 ± 56 <sup>ac</sup>	1,548 ± 40 <sup>c</sup>
B	18-19	72	17.0 ± 1.3 <sup>ade</sup>	3.4 ± 0.4 <sup>ae</sup>	0	661 ± 54 <sup>ae</sup>	1,052 ± 54 <sup>ae</sup>	—
C	18-19	11	4.5 ± 1.0 <sup>bd</sup>	0	0	992 ± 158 <sup>b</sup>	—	—
D	18-19	82	0	0	0	—	—	—
E	4-5	28	58.0 ± 3.5 <sup>c</sup>	18.2 ± 1.1 <sup>c</sup>	0.57 ± 0.05 <sup>c</sup>	86 ± 21 <sup>cf</sup>	171 ± 33 <sup>cg</sup>	1,220 ± 64 <sup>c</sup>
F	4-5	18	51.6 ± 5.4 <sup>e</sup>	19.8 ± 3.5 <sup>e</sup>	0	320 ± 90 <sup>ef</sup>	586 ± 113 <sup>eg</sup>	—

Abbreviations used: MF, mount frequency; IF, intromission frequency; EF, ejaculation frequency; ML, mount latency; IL, intromission latency; EL, ejaculation latency.

Values are means ± SEM.

Same letters in a column indicate a significant difference between those two groups ( $p < 0.005$ ), except for f ( $p < 0.025$ ).

the remaining 40% exhibited mounts and intromissions but no ejaculation (Group F). Additionally, there were significant differences in ML and IL values ( $p < 0.025$  and  $p < 0.005$ ), respectively.

As age increases, the variations in the sexual performance of rats increase. Since full capacity of male sexual behavior may not be manifested by a single test, especially among older animals, six copulatory behavior tests for older rats and three for younger ones were conducted in the present study. It should be noted that the performance observed in each sexual behavior test for each rat of Groups A, B, C, E and F was not always consistent. If a rat had lost the ability to demonstrate a specific component of sexual behavior, this animal failed to show this component in all six or three behavior tests.

All scores for various parameters of copulatory behavior in Group A were significantly different ( $p < 0.005$ ) from those observed in Group E, demonstrating that copulatory activities in male rats decline as age increases. This is consistent with the previous findings of several authors (Larsson 1958, Chambers and Phoenix 1984, Hsu et al. 1986, Smith et al. 1992). Among old rats, 58% displayed mounts (Groups A, B, and C), 52% exhibited intromissions (Groups A and B); however, only 16% showed ejaculations (Group A). These results agree with those of Larsson (1958); the components composing sexual behavior are unequally affected by senility and the ejaculatory reflex disappears first. Although Group D subjects did not copulate in the present study, it does not exclude the possibility that some of them might be still able to exhibit mating behavior, if the observation period were prolonged (Larsson and Essberg 1962).

Old rats of Group B and young rats of Group F showed mounts and intromissions, but they failed to ejaculate. However, the MF and IF value for Group B were significantly lower ( $p < 0.005$ ) than those of Group A, while no significant difference in MF and in IF were found between Groups E and F. Therefore, the underlying mechanisms for ejaculation failure in old rats may be different from those in young rats. Structural and/or functional changes in the neuroendocrine system

mediating copulatory behavior may cause loss of ejaculation among old rats (Tsai et al. 1991). However, no explanation can be offered for the failure of ejaculation in young rats at present.

Old male rats demonstrate qualitatively different types of sexual performance. Distinction of various types of sexual performance in aged male rats is critical in evaluating the nature of aging on sexual behavior-related studies and neuroendocrine analysis.

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## References

- Chambers KC, CH Phoenix. 1984. Testosterone and the decline of sexual behavior in aging male rats. *Behav. Neural Biol.* **40**: 87-97.
- Gray GD, ER Smith, DM Dorsa, JM Davidson. 1981. Sexual behavior and testosterone in middle-aged male rats. *Endocrinology* **109**: 1597-1604.
- Hsu HK, C Hsu, JYL Yu, MT Peng. 1986. Effects of long-term testosterone replacement on copulatory activity in old male rats. *Gerontology* **32**: 10-17.
- Larsson K. 1958. Sexual activity in senile male rats. *J. Geront.* **13**: 136-139.
- Larsson K, L Essberg. 1962. Effect of age on the sexual behaviour of the male rat. *Gerontologia* **6**: 133-143.
- Smith ER, ML Stefanick, JT Clark, JM Davidson. 1992. Hormones and sexual behavior in relationship to aging in male rats. *Horm. Behav.* **26**: 110-135.
- Tsai HW, MY Tai, YF Tsai, MT Peng. 1991. Numbers of the LHRH neuron in preoptic area are critical to male sexual behavior in aged rats — a preliminary report. Abstract of the 6th Joint Annual Conference on Biomedical Sciences, Taipei, p. 158.

## 老年雄鼠性行爲表現之差異性

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一般而言，雄鼠的性行爲會隨著年齡的增加而逐漸衰退。在本研究中，我們觀察197隻年老雄鼠(年齡為18至19個月)，根據其性行爲的表現，發現有如下四組不同的類型：其中16%可表現出騎乘、插入和射精等完整的交配行爲(A組)；而36%的年老雄鼠可表現出騎乘和插入的動作，但無法射精(B組)；有6%的年老雄鼠僅表現出騎乘的動作，但無法插入和射精(C組)；而有42%的年老雄鼠則無法表現出任何交配的動作(D組)。進一步比較各組的騎乘、插入和射精的頻率以及潛伏期等各單項值時，除了B組和C組的騎乘潛伏期二者間沒有差異外，其餘都達到統計上的顯著差異( $p < 0.005$ )。因此本研究結果顯示雄鼠年老時其性行爲表現上至少可以區分為四組不同的類型。

關鍵詞：性行爲，雄鼠，年齡。

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