Sexual preference in female rats:

I. Choices in tests with copulation¹

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A total of 10 females was tested for tendencies to repeat choices of the same four males during tests with copulation. The females were tested on three daily trials once a week for three weeks. The results indicated that the Long-Evans females repeated choices of males slightly in the last trial each day but chose randomly from week to week. The Sprague-Dawley females showed a marked tendency to return to the same males in the last week but chose males randomly when only the trials were considered.

Several of the current techniques for assessing the presence, absence, or degree of sexual motivation in rats are based on the amount of work the animal will do to obtain a sexual partner. Female rats have been observed to press levers or to leave "safety zones" when males are offered as reward (Bermant, 1961; Pierce & Nuttall, 1961). These methods of assessment are weakened to the extent that factors operate independent of sexual motivation. Female rats are known to avoid male rats after receiving intromissions and ejaculations (Pierce & Nuttall, 1961). A "sensitive" (avoiding) female could then be incorrectly judged as lacking sexual motivation (approach). Female rats also may not be uniformly receptive to all males. As Beach & Le Bouef report (1967), many female dogs will not mate with certain males. "Discriminating" (preference) female rats could then appear to be less sexually motivated when they confine their choices only to certain males. These problems are examined in this series of studies.

Method

Four male Long-Evans rats, 200 days old, served as Ss to be leashed in apparatus corners. Two of the males were rejected and two were chosen for copulatory reliability in a previous experiment (Rodgers & Law, 1967). The females tested for sexual preference were either Sprague-Dawley albino (N=5) or Long-Evans hooded rats (N=5). The Long-Evans females (LE) were ovariectomized and sexually inexperienced. The Sprague-Dawley females (SD) were intact and had previously served as colony breeders.

The basic apparatus used for all testing was a 40 x 40 x 9 in. box. The "safety zone" was a cylinder of hardware cloth 16 in. diameter, 9 in. high secured to the center of the box. Females could exit or retreat back into this wire mesh circle through 3-1/2 x 5 in. holes. Each quadrant of the box was partitioned perpendicularly from the side to the center by 9 in. high 3/8 in. plywood so that females could enter and exit only one quadrant at a time, and so that

each male could not see adjacent males. Permanent collars for each male and fixed leashes for each apparatus corner (16 in. radius) were constructed from a lightweight keychain. Males were leashed to each corner 10 min before each test. The males were adapted to the leashes and apparatus for 24 h at one week before testing. Females were adapted to the apparatus for 1 h at two days before testing.

Once each week for three weeks receptivity was induced in the females by an injection of 500 µg diethylstilbesterol (IM) followed by an injection of 1.25 mg progesterone (IM). Females were first tested 1-1/2 to 2-1/2 h after the progesterone injection for one 10 min trial. Each trial started when the E placed a female in the center choice area of the apparatus. If lordosis occurred during this 10 min period this S was tested on two additional 10 min trials spaced at an interval of from 15-45 min. When a lordosis did not occur on the initial trial, three trials were given 6 h later. Those females not lordosing on the first test always lordosed on the later retest. All animals were returned to their home cages during this 6 h interval. The frequencies and durations of choices made by females and the mounts, intromissions, and ejaculations by each male were coded by the E activating microswitches on an event recorder.

Results

Each choice by a female was given a "preference score" of 0, 1, 2, or 3 according to whether 0, 1, 2, or 3 other males were subsequently chosen without repeating choices of any male. If a female returned to the same male after previously choosing him she would be scored 0 (maximum preference). For each female the frequencies of scores 0, 1, 2, or 3 were summed for each trial. Frequencies were then summed for LE females and SD females separately. In Fig. 1A these frequencies are converted to relative proportions of occurrence of each preference score on Trial 1 and Trial 3 over the three weeks of testing receptive females in the presence of males. Chance levels of preference scores are shown for comparison. It can be seen that the LE females tended to avoid repetitions of choice of males on Trial 1 but increased repetitions by Trial 3. By a Chi-square analysis of these proportions of preference on Trial 1, significance ($X^2=54.6$, $df=3$, $p<.001$) is due largely to a greater than chance preference score 3 (visits 3 males before repetition) and a less than chance score 1 (visits 1 male before repetition). The increased sexual preference by Trial 3 ($X^2=17.1$, $df=$

Figs. 1A, B. The proportion of occurrence that 0, 1, 2, or 3 males were chosen before repetition of any choice are shown for the Sprague-Dawley and Long-Evans females on Trials 1 and 3 averaged over three weeks (A) and on Weeks 1 and 3 averaged over three trials (B).

3, $p < .001$) is due largely to an increased proportion of score 1. The SD females showed chance levels of sexual preference on Trial 1 ($X^2 = 5.0$, $df = 3$, $p > .10$). By Trial 3 a slight "warmup" in sexual preference is evident ($X^2 = 12.3$, $df = 3$, $p < .01$). Increased proportions of score 1 account for these results. In Fig. 1B the proportions of occurrence of scores are shown for Weeks 1 and 3. Here the LE females choose males at chance levels on Week 1 ($X^2 = 3.1$, $df = 3$, $p > .10$) and on Week 3 ($X^2 = 6.2$, $df = 3$, $p > .10$). The SD females avoid returning to the same male on Week 1. The less than expected score 0 largely accounts for this significance ($X^2 = 19.8$, $df = 3$, $p < .001$). By Week 3 these females can be seen to return to the same male. The greater than chance score 0 and the less than chance scores 2 and 3 account for these results ($X^2 = 37$, $df = 3$, $p < .001$).

The choice patterns for the first four choices

(1 score/S/trial) were analyzed by the binomial model of exact probability for n choices. The LE females showed a chance level of occurrence of the joint scores 0 and 1 on Week 1 (8 out of 14 choices, $p > .18$), and on Week 3 (10 out of 13 choices, $p > .13$). The SD females did not significantly repeat choices on Week 1 (8 out of 15 choices, $p > .14$) and did repeat significantly on Week 3 (12 out of 13 choices, $p < .019$).

Discussion

The results obtained in this report indicate that not all sexually receptive female rats are "indiscriminate" in their choices of males. The SD females chose males at random when only the daily trials were analyzed for choice patterns. However, the SD females avoided choice of the same males during the first week but showed a strong tendency to go back to the same male by the third week. The LE females chose males at random when only the three weeks of choices were considered. These females, however, tended to avoid choices of the same males during the first trial but indicated a slight male preference by the last trial each day. The females repeated choices over a 10 min trial (average of 12 choices/trial) in essentially the same manner that was evident in the first four choices of each trial.

While these results do not preclude a valid test of sexual motivation when only the degree of approach to all males is considered, they do indicate that sexual motivation should be inferred with caution since females can avoid approaches to certain males and confine approaches to other males. Female rats may not be so "promiscuous" as demanded by conventional tests of sexual motivation.

References

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Note

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