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Prenatal Stress: Effects on Sexual Receptivity in Female Rats

M. Rojo, B. Marín and A. Menéndez-Patterson

Departamento Interfacultativo de Fisiología
(Medicina y Biología)
33006 Oviedo (Spain)

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Pregnant primiparous rats were submitted to daily immobilization stress for 3 hour periods which were increased 15 minutes every third day. A considerable increase in the receptivity to the male was observed in the prenatally stressed females versus controls. Female offspring from both groups did not show any differences in body, adrenal, ovary and brain weights.

Key words: Prenatal stress, Sexual receptivity.

Stress during gestation has been associated with different alterations during pregnancy (11), maternal behavior (13) and disorders in the offspring such as changes in body weight (9) or in behavior (4, 6, 7). Sexuality is modified for males as well as for females. In this way, demasculinization and feminization (2, 15) or increases in the levels of ejaculation (12) were tound in male offspring. On the other hand, female offspring showed disrupt oestrus cycles, spontaneous abortions or reduced fertility (5). However, other results showed that prenatal stress did not alter reproductive function in female offspring (1, 12). It is well known that the expression of adult pateerns of sexual behavior depends on exposure to perinatal androgen (10). In this way, an increase in the weak adrenal androgern, androstenodione, from the maternal or fetal androgen cortices and a concurrent decrease in the testosterone levels were observed in prenatally stressed fetal males (14), as well as in plasma from prenatally stressed fetal females which contained higher levels of testosterone than fetal males (16). The present work studies the effects of a low prenatal stress on the sexual receptivity in female rats.

Materials and Methods

Primiparous female Wistar rats (n = 22) were used at the age of 100-110 days. The animals were kept under standard conditions of light (12D-12L) and temperature (23 ± 3 °C) with free access to food and water. Day 1 of pregnancy was defined

by a spermpositive vaginal smear. Pregnant rats were then divided at random into two equally sized groups. Rats from the experimental group were placed in an 18 × 17 cm plastic tube and tail position from 3 h daily (6 days a weeck). Every third day, time was increased 15 min to avoid a possible adaptation. The control group received no stress. Offspring were weaned 28 days after delivery. The sexual behavior test carried out at the age of 5 months for the females was similar in many ways to the described by EDWARD and PFEIFLE (3). A sexually active male was tethered at one end by means of a cord secured to the top of a wooden rectangular arena (62.5 × 60 × 30 cm). The cord attached the male by a harness (composed of two rubber bands, one fitted around his torso) and allowed free movements of the males within the arena, the harness and tether arrangement did not in any obvious way compromise the male's ability to mount, intromit and ejaculate (provided the female permitted sexual contact by visiting him). The female under study was in the oestrus phase and had been habituated to the arena and the attached male in two previous oestrus phase. A simple test lasted 5 min and was begun by placing the experimental female on the opposite end of the arena facing the male. The parameters studied were: lordosis, hop, dart, groom, nosing, crawl over, crawl under, push-past, genital sniff, follow and lordosis quotient (no. of lordosis/no. of mounts × 100). At the age of 6 months, the females were weighed and killed by decapitation; their braim, ovaries and adrenal glands were removed and also weighed. Statistical analysis by using the Student's «t» test.

Results and Discussion

Table I shows the effects of prenatal stress on sexual behavior in female offspring. A significant increase in the number of lordosis, hops, darts and lordosis quotient was observed. None of the remaining parameters studied occurred frequently enough to make individual analysis meaningful.

The most important finding is that low prenatal stress alters female sexual behavior, increasing receptivity to the male. Contradictory results reported by MEISEL and WARD (8) and HERRENKOHL and SCOTT (6), indicate that prenatal stress did not alter sexual receptivity. Methodological differences must be considered. The author's subjects were exposed to a higher stress including heat-restraint during the last third of pregnancy, which produced an increase in the adrenal weights in the female offspring (9). Our rats did not show any significant differences in this parameter ($t(26) = 0.15$); neither in brain ($t(26) = 1.26$), ovary ($t(26) = 0.75$) or body weight ($t(26 = 0.47$).

Table I. *Effects of prenatal stress on sexual behavior in female rats.* Mean ± S.E. Number of animals in parentheses.

Parameters	Experimental (12)	Control (13)	t	P
Lordosis	8.67 ± 1.48	1.23 ± 0.69	4.86	0.001
Hop	7.50 ± 1.54	0.92 ± 0.41	4.46	0.001
Dart	7.00 ± 1.03	2.08 ± 0.62	3.61	0.01
Lordosis quotient *	62.49 ± 10.22	24.92 ± 11.71	2.54	0.05

* Lordosis quotient = no. of lordosis/no. of mounts × 100.

These resuld would be due to the lower intensity of our stress model, which did not affect the weight of a gland so sensible to stress situations as is the adrenal gland. In this sense, with this stress model, male offspring showed an increase in the number of ejaculations (12), contrary to demasculinization and feminization that heat-restraint stress produced (2, 15). We think that different stress produces different effects, and according to our results, a moderate stress throughout gestation improves the sexual behavior of the offspring, increasing the female's receptivity. Thus, the prenatal stress, characterized by a modification in the sexual behavior of the offspring, could result from a desynchronization between CNS maturation and the levels of patterns secreted during life, which would also depend on the type of stress used.

Resumen

Ratas preñadas sometidas diariamente a un estrés de inmovilización de tres horas, incrementado en 15 minutos cada tercer día, muestran, frente a machos normales, incremento de la receptividad sexual. No se aprecian, en estas hembras, diferencias significativas en los pesos corporal, de glándulas adrenales, ovarios ni cerebro.

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