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MURICIDITY OF FEMALE RATS DURING PREGNANCY AND LACTATION

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UDC 612.664-08:612.833.97

KEY WORDS: muricidity; pregnancy; lactation.

The instinctive activity of animals includes various manifestations of aggressiveness, such as predatory behavior, defense of territory, response to painful stimuli, etc. Starting from 1956 [3] a special form of aggressiveness in rodents, namely muricidity, has been intensively studied. This term is used to describe the ability of rats to attack mice and to kill them. The frequency of manifestation of spontaneous muricidity in rat populations may vary within wide limits depending on the animals' sex, age, and genotype. For instance, populations of brown rats may contain up to 80% of muricidal individuals, whereas rats of the Long-Evans, Wistar, Sprague-Dawley, and August lines as well as noninbred albino rats may have only 45, 30, 5, and 0%, respectively. Muricidal male rats are always more numerous than females. An increase in the number of muricidal individuals is observed in experiments with acute starvation of rats, social isolation, exposure to painful stimuli, and destruction of certain parts of the brain [4-6]. Hypotheses have been put forward to explain the neurophysiological and biochemical mechanisms of regulation of this complex behavior. However, differences in the models used and the contradictory nature of the results do not permit any definite opinion to be formed regarding these mechanisms. Meanwhile the exhibition of muricidity in rats can provide a convenient model with which to study biochemical processes in the brain responsible for functioning of the CNS in general and for instinctive activity of animals in particular.

Considerable changes in the neuroendocrine and biochemical status of female animals take place under natural conditions during the period of rearing and feeding of their young. Accordingly, in the investigation described below, spontaneous muricidity in female rats was studied during the period of pregnancy and lactation.

EXPERIMENTAL METHOD

Noninbred female rats weighing 25-280 g were kept under controlled conditions in the Laboratory Animals Nursery, Academy of Medical Sciences of the USSR. The animals were divided into groups depending on the stage of pregnancy (10, 20, and 23-25 days) and lactation (1, 5, 10, 15, and 20 days), and a corresponding control group also was set up. Muricidity of the female rats was tested by placing one albino mouse with the rat in the cage. The rats were

Research Institute of Medical Enzymology, Moscow. (Presented by Academician of the Academy of Medical Sciences of the USSR S. S. Debov.) Translated from Byulleten' Eksperimental'noi Biologii i Meditsiny, Vol. 95, No. 4, pp. 98-100, April, 1983. Original article submitted July 9, 1982.

TABLE 1. Behavioral Responses of Pregnant and Lactating Rats toward a Mouse Introduced into the Cage

Group of animals	Orienting reaction	Dragging into the nest	Attack with biting	Muricidity
Control	16	0	0	0
Pregnancy, days				
10	18	0	0	0
20	20	9	4	1
23-25	20	14	12	8*
Lactation, days				
1	20	11	7	2
5	20	20	7	0
10	20	12	5	0
15	20	6	2	0
20	20	2	0	0

Legend. Each group contained 20 animals.

*) Differences between experiment and control significant at the $P < 0.01$ level.

regarded as muricidal if they killed the mouse within 1 min after introduction. In addition, other behavioral responses of the female rats were recorded: the orienting reaction (pursuit of the mouse, sniffing it), dragging the mouse to its nest, attacking the mouse by biting and striking it with its paw.

EXPERIMENTAL RESULTS

The data in Table 1 show that female rats exhibit a well-marked orienting reaction to the mouse. Nearly all the rats pursued the mouse and sniffed it. Many pregnant and lactating females also exhibited behavior characteristic of the maternal instinct, such as dragging the mouse into the nest; whenever the mouse left the nest, the rat usually put it back again. It is difficult to assert definitely that dragging the mouse into the nest is a manifestation of maternal behavior, for the rats performed similar actions with pieces of food and unfamiliar objects thrown into the cage. Moreover, some of these rats accompanied the first appearance of the mouse in the cage with an aggressive attack, with biting and striking with the paw. This attack was particularly severe when made by female rats during the last 23-25 days of pregnancy and before the beginning of parturition, and in the case of eight rats the attack ended with killing of the mouse. These rats held the mouse with their paws, bit it rapidly in the region of the neck and back, until the victim was completely motionless. The rat then left the mouse or dragged it into the nest. This type of behavior by the rats was defined as muricidity. Individual cases of muricidity also were recorded in certain other groups of rats, but the difference between the experiment and control was not significant ($P > 0.1$).

Zoosocial contacts of pregnant and lactating rats with mice were investigated in 1956 by Karli [3]. In these experiments rats were kept together with mice throughout the period of rearing and feeding their young. Different forms of behavior of the female rats with respect to the mice were observed, including certain types of maternal behavior, but no aggressive reactions or muricidity were found, even if the mice ate the young rats. The reason was evidently the long period of contact with the formation of stable zoosocial relationships.

In another investigation Baenninger analyzed the behavior of pregnant and lactating rats of a highly muricidal population of the Long-Evans line [1]. This worker used a short-term test of muricidity of female rats at different periods of pregnancy and lactation and found that the rats continued to exhibit aggressive behavior in all groups tested. On this basis he concluded that maternal behavior is independent of muricidity. However, although the effect of prolonged contact between mice and female rats was excluded in this investigation, the experimental conditions were such that a possible weakening of muricidity could be detected, but not an increase. These shortcomings were taken into consideration in an investigation by Herrenkohl [2], who used short-term testing of pregnant and lactating Sprague-Dawley rats with weak spontaneous muricidity. Groups of 20 rats with early pregnancy (4-5 days), late pregnancy (19-20 days), and early lactation (3-4 days) were distinguished. As a result

of this investigation only one muricidal rat was found in the late pregnancy group, so that it was impossible to discover any general rule with sufficient reliability. Thus, by restricting the period of late pregnancy in the rats to 20 days, this worker did not investigate the short (not more than 3-5 days) critical period of late pregnancy immediately before parturition, during which we observed the appearance of a significant number of cases of attacking and killing of mice by the rats.

Our investigations indicate that neuroendocrine changes in female rats accompanying the onset of birth activity bring about the appearance of aggressive reactions and muricidity in rats.

The authors are grateful to A. T. Khromykh, Director of the Laboratory Animals Nursery, Academy of Medical Sciences of the USSR, and to N. G. Savel'eva, Animal Care Specialist at the Nursery, for their cooperation in this investigation.

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