

## Effects of Caesarean Delivery upon Maternal Behavior in Rats.\* (20416)

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Experience in building nests and caring for young is not essential for biologically effective maternal behavior in laboratory rats, for primiparous females reared in isolation bear and rear young successfully (Sturman-Hulbe and Stone(1); Beach(2). Wiesner and Sheard (3) reported that female rats will display maternal behavior even though their young are removed by caesarean section, but this experiment lacked several necessary controls and there were no quantitative measures of the behavior. The present study was conducted to compare the maternal reactions of primiparous females that gave birth normally with those of females delivered by caesarean operation.

**Methods.** Twenty virgin female rats of the Sprague-Dawley strain were mated to males and placed in individual observation cages 2½ days before parturition was expected. The cages were 3 feet square and 2 feet deep, and 100 strips of paper toweling were suspended from the walls in such a way that the rat could easily detach them for use in nest building. Twenty-four hours after the animals were put in the cages, records were made of the number of paper strips detached and the grade of nests built. At this time 10 rats constituting the experimental group were subjected to caesarean operation and then returned with their young to the observation cages. Since the experimental rats did not lactate normally their young received little or no nourishment. Therefore, to make sure that these females would be stimulated by active babies during the retrieving test, each experimental animal was given a new, foster litter every 24 hours. The pregnant control rats remained in the cages and gave birth normally. Twenty-four hours after the young had been delivered, either surgically or naturally, the first retrieving test was conducted. The mother was removed from the cage, the

young were scattered about the cage floor and the female's behavior after being returned to the cage was recorded. If a female failed to retrieve within 15 minutes, the young were replaced in the nest and another test was conducted 24 hours later. This procedure was repeated until retrieving occurred or until 72 hours had elapsed since parturition. Twenty-four hours after the final retrieving test the nest was destroyed, new paper strips were hung from the walls, and the number of strips detached and grade of nest built were recorded the following day.

Ten nulliparous( *i.e.* non-pregnant and non-lactating) females constituted a second control group. These rats were supplied with foster young and given the same tests as the other groups.

**Results.** Before parturition all of the pregnant control animals and 7 of the 10 experimental rats detached an average of 90 of the 100 paper strips. The remaining 3 experimental cases and all 10 of the nulliparous females detached an average of only 24 strips.

In the post-parturitional nest-building test the differences persisted, with 10 controls and the same 7 experimental animals detaching an average of 98 strips as contrasted with a mean of 26 strips for the 10 nulliparous and 3 of the experimental rats. The grade of nest built corresponded to the amount of material used. The nests of all nulliparous and 3 of the experimental rats were scored "poor," whereas the 7 active experimental females and 9 of the 10 lactating controls were rated as "excellent." One control nest was scored "good."

None of the nulliparous females retrieved foster young in any of the 30 tests in which they were observed, and retrieving was absent in the 3 experimental rats which had failed to build nests. All of the 10 control and 5 of the experimental females retrieved readily in the first test, 24 hours post-partum. One experimental case did not respond in the first test but did so 48 hours post-partum, and one

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more experimental rat retrieved only after 72 hours. There was no observable difference in the nature of the retrieving behavior of the normally-delivered mothers and the caesarean cases.

These results suggest that the process of giving birth and associated activities such as cleaning the young and eating the placenta are not essential precursors to post-parturitional nest building and caring for the young. The fact that 3 of the experimental females failed to display maternal behavior may have been due to one or all of several factors. They may have suffered more severe shock as a result of the operation than did the remaining 7 rats in this group. They may have been resistant to the stimulus of foster young in the retrieving tests. Or they may have been less "maternal" even before the operation. It has been reported that some otherwise normal female rats will not build nests or care for their young (Beach, 1937). The 3 negative experimental animals in the present experiment may belong in such a category. Their

failure to build nests prior to operation is evidence in favor of such an interpretation.

Regardless of the explanation for the 3 non-maternal animals, the occurrence of normal nest-building and retrieving in 7 experimental cases supports the conclusion advanced above. Furthermore, since the experimental females probably did not lactate normally it can be added provisionally that secretion of milk and nursing are not necessary for maternal responsiveness. Since mere contact with new-born rats did not evoke maternal reactions in the nulliparous controls it appears probable that the key factors involved in maternity are the hormonal changes associated with pregnancy and its termination.

1. Sturman-Hulbe, M., and Stone, C. P., *J. Comp. Psychol.*, 1929, v9, 203.
2. Beach, F. A., *J. Comp. Psychol.*, 1937, v24, 393.
3. Wiesner, B. P., and Sheard, N. M., 1933, *Maternal Behavior in the Rat*, Edinburgh, Oliver and Boyd.

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### Pathologic Physiology of Mammalian Blood Platelet Utilizing P<sup>32</sup> Tagged Rabbit Platelets.\* (20417)

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Recently much attention has been focused on the etiology and pathologic-physiology of thrombocytopenia. One of the aspects studied has been the life span of the normal platelet in patients with various types of thrombocytopenia. This was accomplished by transfusing platelet-rich polycythemic blood into persons with thrombocytopenia. The work was begun in an effort to perfect a method for the study of platelet survival in the rabbit prior to attempting a similar study in human beings. During the course of the investigation some interesting observations concerning the physiology of the platelet have been made. In addition, a new technic is described which may

be of value in future studies of this cell.

Weisberger and Heinle(1) have utilized the technic of isotopic labelling to study the survival rate of transfused leukocytes. A similar procedure has been devised for the platelet utilizing radioactive phosphorous. Julliard (2) and his co-workers in France have very recently published some data on the fate of transfused radioactive platelets. Their results are comparable to those herein reported.

*Methods and results.* Unagglutinated platelet suspension, essentially free from erythrocytes and leukocytes are prepared in the following manner. Silicon technic is used throughout the procedure. 45 cc of rabbit heart blood collected in 5 cc of Na Sequestrene is centrifuged at 800 rpm for 15 minutes. The platelet rich plasma is then transferred to

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