

CIRCADIAN RHYTHM OF MITOTIC DIVISION OF KIDNEY CELLS IN RATS OF DIFFERENT SEXES

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UDC 612.46:(612.014.3:612.6)"52"

In adult rat kidneys a circadian rhythm of mitosis was found only in males (the number of mitoses reaching a maximum in the morning and afternoon and a minimum in the evening and night). The mean coefficient for the 24-h period was three times greater for males than for females. No differences in the character of the curve of the circadian rhythm and level of mitosis in the kidneys of sexually immature rats could be found between males and females.

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The existence of a circadian rhythm of mitosis in the kidneys of adult and sexually immature male rats has been established [2-4]. The mitotic coefficient and radioactive index in the kidneys of rats aged 1-2 months have been shown to be higher than in kidneys of rats belonging to older age groups, in which no differences could be found in these indices depending on the animal's age [5].

In this investigation the circadian rhythm of mitosis in the kidneys of male and female rats of different age groups was compared.

EXPERIMENTAL METHOD

Sexually immature male and female Wistar rats with a mean weight of 52 g and noninbred sexually mature male and female albino rats with a mean weight of 156 g were used in the experiment. The animals were kept under conditions of natural illumination and diet. They were sacrificed by decapitation every 3 h throughout the 24-hour period. Material was fixed in Carnoy's fluid and paraffin sections 7 μ in thickness were stained with hematoxylin-eosin. The number of mitoses was counted in 20,000-25,000 cells of the renal cortex, the mitotic coefficient was calculated in promille, and the results were subjected to statistical analysis by the Fischer-Student method.

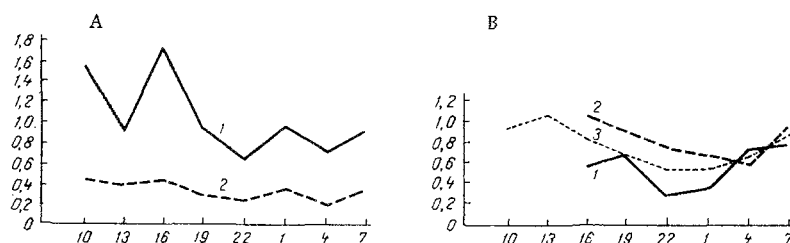


Fig. 1. Mitotic activity in kidney of adult (A) and sexually immature (B) rats at different times of day and night. 1) Males; 2) females; 3) mean for males and females. Abscissa, time of day; ordinate, mitotic coefficient (in ‰).

Laboratory of Growth and Development and Laboratory of Histophysiology, Institute of Experimental Biology, Academy of Medical Sciences of the USSR, Moscow (Presented by Active Member of the Academy of Medical Sciences of the USSR N. A. Kraevskii). Translated from *Byulleten' Éksperimental'noi Biologii i Meditsiny*, Vol. 67, No. 1, pp. 78-80, January, 1969. Original article submitted January 29, 1968.

EXPERIMENTAL RESULTS

A circadian rhythm of mitosis in kidneys of rats weighing 156 g (5 males and 5 females were used at each period of fixation) was found only in males (Fig. 1A): the number of mitoses reached a maximum during the morning and afternoon and a minimum during the evening and night. Fluctuations in mitotic activity throughout the course of the 24-h period in the females were very slight and not significant. Furthermore, their mean mitotic coefficient for the 24-h period (0.35%) was three times lower than in the males (1.14%).

No definite results were obtained in the group of rats weighing 52 g (Fig. 1, B). When the material was fixed at 10 A. M. and 1 P. M. the sex of the animals was disregarded and the number of animals of the same sex at different periods of fixation varied from 2 to 6 (at 7 P. M. no females were fixed). Examination of the common curve for males and females (mean mitotic coefficient for the 24-h period 0.73%) shows that the number of mitoses reached a maximum during the morning and afternoon and a minimum during the evening and night (the difference between the points for 1 and 10 P. M. is statistically significant, $P = 0.009$), in agreement with the character of the curve of circadian rhythm of mitosis in the kidneys of sexually mature male rats. Examination of the curves plotted from mean data obtained separately for males and females revealed no significant differences between them, either as regards the level of mitotic activity (mean mitotic coefficient for the 24-h period for males and females 0.55 and 0.81% respectively), or as regards the character of the curve of circadian rhythm of cell division.

The results obtained indicate that a circadian rhythm of mitosis in the kidneys of rats weighing 156 g exists only in males. In the females of this age group no circadian rhythm could be detected. Interesting results in this connection were obtained by Bogatova [1], who showed that the circadian rhythm of mitosis in the adrenal cortex of sexually mature male rats differs from that in females. In the kidneys of rats weighing 52 g, no sex differences were found in the character of the curve of circadian rhythm of mitosis. The decrease in mitotic coefficient described in the literature with an increase in the animal's age [5] was observed only in females, while in sexually mature male rats, on the other hand, the mitotic coefficient was twice as high as in sexually immature rats (the difference in both cases is statistically significant, $P < 0.0001$). It must be remembered that in the present investigation sexually immature Wistar rats and sexually mature noninbred rats were used. It may be supposed that the differences detected in the circadian rhythm of mitosis and the values of the mitotic coefficient in the kidneys of rats of different sexes are due to factors of hormonal regulation.

LITERATURE CITED

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